THE NATIONAL ASSOCIATION
FOR THE STUDY AND PREVENTION
OF TUBERCULOSIS

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The National Association for the Study and Prevention of Tuberculosis

TRANSACTIONS
OF THE
EIGHTH ANNUAL MEETING
WASHINGTON, D. C., May 30–31, 1912

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1912

The National Association for the Study and Prevention of Tuberculosis

1911–1912

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1912–1913

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EIGHTH ANNUAL MEETING

OF

The National Association for the Study and Prevention of Tuberculosis

THE eighth annual meeting of The National Association for the Study and Prevention of Tuberculosis was held at the New Willard Hotel, Washington, D. C., on May 30 and 31, 1912.

The President of the Association, Dr. Mazyck P. Ravenel, called the Association to order at 11 o'clock on the morning of May 30th. Following the address of the President and the report of the Executive Secretary, in accordance with the regular procedure of the Association, the following Committee was appointed by the chair to present nominations to fill vacancies in the Board of Directors:

Dr. William C. White, Pittsburgh, *Chairman*
Dr. A. M. Forster, Colorado Springs
Mr. F. H. Mann, New York
Mr. W. S. Ufford, Washington
Dr. Gordon Wilson, Baltimore

The following Committee on Resolutions was also appointed by the chair:

Dr. H. R. M. Landis, Philadelphia, *Chairman*
Dr. W. J. Barlow, Los Angeles
Dr. H. M. Kinghorn, Saranac Lake
Dr. T. B. Sachs, Chicago
Mr. J. R. Shillady, Buffalo

At the regular business meeting of the Association held at noon on May

31st the following were unanimously elected Directors of the Association for terms of five years:

Dr. W. Jarvis Barlow, Los Angeles
Miss Mabel T. Boardman, Washington
Mr. Homer Folks, New York
Dr. Charles J. Hatfield, Philadelphia
Mr. John A. Kingsbury, New York
Col. J. L. Ludlow, Winston-Salem
Dr. Cabot Lull, Birmingham
Dr. C. O. Probst, Columbus, Ohio
Dr. E. C. Schroeder, Washington
Surgeon-General C. F. Stokes, Washington
Dr. E. L. Trudeau, Saranac Lake
Dr. W. H. Welch, Baltimore

Dr. H. E. Dearholt, of Milwaukee, was elected a Director to fill the unexpired term of the late Surgeon-General Walter Wyman.

The following resolutions were reported favorably by the Committee on Resolutions and were unanimously adopted by the Association:

Resolved, That the Executive Secretary be requested to correspond with the officers of the American Veterinary Medical Association, calling to their attention the following points:

1. The close relationship between the work of The National Association for the Study and Prevention of Tuberculosis and the work of the veterinary medical profession.
2. The small number of veterinarians who have joined The National Association for the Study and Prevention of Tuberculosis.
3. Inviting them individually to take membership in The National Association for the Study and Prevention of Tuberculosis.
4. Inviting the veterinarians to arrange a part of the program of the Pathological Section for the next annual meeting of the National Association.

Resolved, That The National Association for the Study and Prevention of Tuberculosis indorse the following terms of a resolution adopted by the Southwestern Conference on Tuberculosis, held at Waco, Texas, April 16, 1912:

> "WHEREAS, Southwestern States have climatic and other natural advantages which have attracted people from other states for years past and especially the sick—and as many of these people come into the Southwest with insufficient funds to maintain themselves until well, as a result of which they become public charges or suffer great privation, which counteracts all possible benefit of climate, and
>
> "WHEREAS, The number of such indigent persons who are careless in

their habits of living and spread their disease, not decreasing, it seems proper for us to issue a warning to the public, and especially to that portion of it afflicted with tuberculosis, and to all physicians, churches, lodges, labor unions, and charitable organizations; therefore be it

"*Resolved*, That the newspapers of the country be asked to give publicity to the following facts:

"(*a*) There are no free hospitals in the Southwest for other than citizens of Southwestern States.

"(*b*) No assistance can be given strangers by charitable associations because the public does not contribute funds for that purpose.

"(*c*) Owing to the large immigration of healthy people there is small chance for employment for sick persons. The number of factories is limited, cheap labor is performed by Mexicans and negroes, ranch and farm work is strenuous, and invalids are not employed by land-owners.

"(*d*) That invalids cannot hope to secure assistance from private individuals because the demands for aid from strangers have exhausted the patience of the people.

"(*e*) That invalids coming to the Southwest should have funds sufficient to carry them for one year, as they cannot hope for restoration to health and strength under that period of time.

"(*f*) That each community should provide proper hospitals, dispensaries, visiting nurses, etc., and care for its own people."

WHEREAS, Hospital care of advanced cases of tuberculosis is essential to the gradual reduction of the present incidence of this disease, and

WHEREAS, Experience has shown that patients will not enter or remain in institutions unless the surroundings are attractive and the care is of a higher standard than now prevails, be it

Resolved, That The National Association for the Study and Prevention of Tuberculosis, in its advocacy of sufficient institutional provision for the advanced consumptive, emphasize the importance of proper care of these unfortunate patients, including sufficient and efficient medical and nursing service, as well as a proper diet, and, further,

Resolved, That the Association indorses the efforts now being made by local communities for the proper care of advanced cases, and approves of the appointment by the Board of Directors of a Committee to investigate the present status of hospitals for advanced cases in this country and to formulate proper standards for their construction and management.

WHEREAS, Attention has been directed to the social and industrial causes of tuberculosis, the relation of dusty trades and other occupational factors to the morbidity and mortality from tuberculosis, and

WHEREAS, The prevalence of special tuberculosis clinics affords an opportunity for the recording of valuable information as to these important factors, therefore be it

Resolved, That the Board of Directors of The National Association for the Study

and Prevention of Tuberculosis be requested to appoint a special committee to consider the possibility of securing the adoption of uniform dispensary records prepared with special reference to recording detailed data on industrial and social factors, past and present, in the patient's history.

WHEREAS, The double red cross has been used as the emblem of The National Association for the Study and Prevention of Tuberculosis for several years, having been adopted officially by said Association in 1906, and

WHEREAS, No fixed standards as to form or dimensions of the double red cross have ever been adopted by the Association, and

WHEREAS, There has been considerable variation in the forms and dimensions of the crosses used by the numerous anti-tuberculosis organizations in the United States and elsewhere, be it

Resolved, That the Board of Directors of The National Association for the Study and Prevention of Tuberculosis be requested to appoint a committee to consider the various questions involved in the history, artistic appearance, form, and proportions of the double red cross as the emblem of the anti-tuberculosis crusade in the United States, and that this Committee be directed to report to the Board of Directors for such action as the Board may deem advisable.

At the suggestion of the President, it was voted unanimously that a telegram conveying the greetings and good wishes of the Association be sent to Dr. Edward L. Trudeau, the first President of the Association.

At a meeting of the Board of Directors, held on Friday afternoon, May 31st, the following officers were unanimously elected for the ensuing year:

Mr. Homer Folks, New York, *President*
Dr. Robert H. Babcock, Chicago
Dr. Edward R. Baldwin, Saranac Lake } *Vice-presidents*
Dr. Henry Barton Jacobs, Baltimore, *Secretary*

The following Directors were elected to serve on the Executive Committee for the ensuing year:

Mr. William H. Baldwin, Washington
Dr. Charles J. Hatfield, Philadelphia
Mr. Frederick L. Hoffman, Newark
Dr. S. A. Knopf, New York
Dr. George M. Kober, Washington
Dr. Walter R. Steiner, Hartford
Dr. William C. White, Pittsburgh

General George M. Sternberg, having declined to accept re-election as Treasurer of the Association, the responsibility of filling the office of Treasurer was referred to the Executive Committee with power to act, and General Sternberg, upon request, consented to serve as acting Treasurer until his successor should be elected.

The Board of Directors also adopted the following resolution:

WHEREAS, General George M. Sternberg, who has been Treasurer of The National Association for the Study and Prevention of Tuberculosis since its organization in 1904, has found it necessary to ask to be relieved from further duty in that capacity, be it

Resolved, That the Board of Directors of The National Association, in reluctantly yielding to this request, desires to place on record its deep appreciation of the invaluable services of General Sternberg not only to the National Association, but to the entire anti-tuberculosis movement and the cause of public health in the United States.

Following the meeting of the Advisory Council on the evening of May 30th, Dr. Charles J. Hatfield, of Philadelphia, was unanimously elected Chairman of the Advisory Council for the next annual meeting.

REPORT OF THE TREASURER

Receipts

To balance on hand May 1, 1911	$2,543.13	
" membership dues	9,190.00	
" donations	1,986.16	
" appropriation from Russell Sage Foundation	11,250.00	
" Red Cross Seals, 1910 Account	7,228.29	
" Red Cross Seals, 1911 Account	3,293.54	
" sale of Lantern Slides	140.75	
" sale of Books, Literature, etc	1,081.43	
" payments for local exhibitions	600.00	
" refunded amounts	23.96	
" advertisements in Tuberculosis Directory	415.00	
" interest	33.53	
" sale of cuts	146.74	
" returns on telephone service	29.45	
" returns on office expense	3.00	
" Red Cross Seal buttons	460.10	
" returns on telegrams	1.30	
" returns on office supplies	1.95	
" sale of pamphlets	1.95	
" returns on rent	342.00	
" returns on Outdoor Life account	1.00	
		$38,773.28

Disbursements

By expenditures for:		
Rent	$2,091.96	
Salaries	15,783.20	
Expenses of Bureau of Publicity	2,478.51	
Expenses of Bureau on Construction	1,201.86	
Printing	6,146.89	
Outdoor Life subscriptions	1,344.64	
Expenses of Exhibitions	2,631.54	
Reporting of Seventh Annual Meeting	225.00	
Expenses of Seventh Annual Meeting	313.50	
Storage	384.48	
Auditing accounts	22.50	
Lantern Slides	128.20	
Refunded amounts	24.34	
Red Cross Seals, 1911 account	322.04	
Red Cross Seals, 1912 account	2.50	
Cuts	130.09	
Telephone Service	226.19	
Incidental office expenses and repairs	98.46	
Red Cross Seal buttons	465.60	
Telegrams	38.20	
Office Supplies	118.96	
Pamphlets	11.92	
Furniture and office equipment	24.90	
Clerical Assistance	1,917.95	
Dues to International Association	122.31	
Expenses of Treasurer	5.00	
Advertising	74.50	
Postage	934.77	
Expenses of Rome exhibit	51.34	
Traveling expenses	741.00	
Field Work	200.00	
Stationery	139.90	
Express	77.26	
		$38,479.51
Balance on hand April 30, 1912		$293.77

George M. Sternberg, *Treasurer.*

NEW YORK, May 27, 1912.

THE NATIONAL ASSOCIATION FOR THE STUDY
AND PREVENTION OF TUBERCULOSIS,
105 East 22d Street, New York.

Dear Sirs: In accordance with the request of Dr. Livingston Farrand, Executive Secretary, we have made an audit of the cash account of the Treasurer of your Association for the year ended April 30, 1912.

The following is a correct summary of the cash transactions for the year as recorded in the cash book:

Balance, May 1, 1911	$ 2,543.13
Receipts	36,230.15
Total	$38,773.28
Disbursements	38,479.51
Balance, April 30, 1912	$293.77

Certification of the cash on deposit May 23, 1912, was obtained from the American Security & Trust Company, of Washington, D. C., and considering the cash transactions ad interim, the cash on deposit April 30, 1912, was verified.

The cash in the hands of the Executive Secretary, which is not a part of the cash book balance, was counted on May 24, 1912, and taking into consideration the disbursements since April 30, 1912, amounting to $382.84, for which reimbursing check had not been received from the Treasurer, the fund of $777.36 was proved.

Yours truly,
(Signed) HASKINS & SELLS,
Certified Public Accountants.

We have examined the accounts of the Treasurer and Executive Secretary and find them correct.

S. ADOLPHUS KNOPF
ALEXANDER M. WILSON } *Auditing Committee.*

Contributors to the funds of the Association for 1911–12 were:

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Mr. Jacob H. Schiff
Mr. Charles W. Harkness
Mr. Warren M. Leeds
Mr. Charles Deering
Mr. William A. Reed
Mrs. Edwin M. Bulkeley
Mr. James Douglas
Mr. John W. Auchincloss
Anonymous
Mr. Henry Batjer
Mr. J. V. V. Booraem
Mr. E. J. DeCoppet
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Mr. William J. Ehrich
Miss Anna M. Verner
Mr. William E. Austin
Miss Florence M. Hall
Mrs. J. E. Whisler
Mrs. Frederick G. Dow
Rabbi Ephraim Frisch
Mr. Charles M. Lea

ADDRESS OF THE PRESIDENT

By Mazyck P. Ravenel, M.D.
Madison, Wis.

In almost all societies and associations there exists a custom which requires the president to deliver a speech called the presidential address. I often think that if the members could foresee the character of this address they would be more careful in casting their ballots. Our own Association shows a peculiar wisdom in putting the presidential address in the beginning of the meeting, when the members are fresh in mind and body and can stand a good deal. With these thoughts I must ask you to bear with me in patience and overlook my shortcomings.

In opening this eighth annual meeting of The National Association for the Study and Prevention of Tuberculosis I feel that my first duty is to pay a tribute to those men who have attained eminence in the campaign against the white plague who have passed away since our last meeting.

In America we have been called upon to mourn the death of General Walter Wyman, Surgeon General of the Public Health and Marine-Hospital Service. General Wyman was prominent in the formation of this Association. He was one of the first directors, and was a member of the Board of Directors at the time of his death. The study of tuberculosis had for years engaged his attention, and under his administration the Government sanatorium was established at Fort Stanton, New Mexico. In other fields of preventive medicine the service of which Doctor Wyman was the head has for a long time been regarded as one of the best in the world. To General Wyman is due much of the credit for bringing this service to its high state of efficiency.

In Europe Dr. Albert Frankel, of Berlin, has died. A practitioner of high order, he was always interested in public movements, and especially in the fight against tuberculosis. He was one of the founders of the sanatorium movement in Germany; a member of the executive committee of the Imperial German Commission for the stamping out of tuberculosis; a member of the Board of Directors of the Sanatorium at Belzig. Up to almost the

day of his death Dr. Frankel continued his public health work, and his contributions are of great importance.

I am not going to burden you with recommendations regarding the future of the Association. One point, however, deserves mention. The membership is not what it should be. We now have enrolled about 2100 men and women, when we should have at least 10,000. The importance of the work we stand for and the wide-spread existence of tuberculosis should demand the interest of a very much greater number than this membership shows. Particularly do I notice a lack of co-operation between this Association and the group of men who of necessity are interested in this same subject, namely, the members of the veterinary profession. In our early days we took steps to bring veterinarians into our membership, and Dr. Leonard Pearson, who will always stand as one of the leading American veterinarians, was early put on our Board of Directors and continued on the Board until his untimely death.

In this connection I may voice one question which has given me much thought. Why is it that we must depend upon an organization of private citizens to lead a campaign for the prevention of tuberculosis? It is a public health matter of the highest importance, and our leaders should be those intrusted with the health of communities and States. It is not necessary to have a society for the prevention of smallpox, or of diphtheria, or scarlet fever. Why then should we be compelled to have one for the prevention of tuberculosis? However, the necessity exists, wrong as it may be, and, for the present, we must attack the problem with all the energy of which we are capable. To do this it is necessary to enlarge our membership and extend our influence.

During the past year a number of notable pieces of work have been given to the public. Of first importance must always be the work tending to prevention of the disease. I feel that I must mention in this regard the work of Dr. Gerald Webb, of Colorado Springs, in the immunization of monkeys and children against tuberculosis. The possibility of immunization by the use of cultures was first shown by Dr. Trudeau, of Saranac Lake, and he must always be regarded as the pioneer in this line of work.

America has also made other notable contributions in the work of Dr. de Schweinitz, who followed Dr. Trudeau closely, and later in the splendid work of Drs. Pearson and Gilliland. Dr. Webb's method is based on the wonderful technic of Dr. Barber, who first devised the method of isolating individual bacteria. In Dr. Webb's work the process of immunization is begun by injecting individual tubercle bacilli and gradually increasing the

number. He has succeeded in producing such a degree of immunity in monkeys that his animals are able to withstand a dose of virulent tubercle bacilli which would be fatal to 20,000 guinea-pigs; or, in other words, 20,000 times the fatal dose for a single guinea-pig. These animals show no illness whatever, and examination of their organs fails to reveal the presence of tubercle bacilli. Dr. Webb has also applied the method to human beings in a limited number of cases, with results which, up to the present time, appear to be excellent. The work done is not sufficient to draw sweeping conclusions from. It should be confirmed and carried further before the final word upon it can be spoken.

A book of unusual interest has appeared during the past year, entitled "Auto-inoculation in Pulmonary Tuberculosis," by Marcus Paterson, in charge of the Brompton Hospital Sanatorium at Frimley, England. Dr. Paterson has applied many of the theories of Sir Almroth Wright to the treatment of pulmonary tuberculosis. A word of explanation to the lay members of the audience may not be out of place.

It has been definitely shown that recovery from infectious diseases is due to the fact that our bodies are able to form protective substances in response to the attack of the germs which cause the disease. These protective substances are known as antibodies. If the body fails to respond to an attack by the formation of antibodies, the patient succumbs. Where the response is good and the antibodies are formed abundantly, recovery takes place, with a resulting immunity against the disease. This immunity persists for a longer or shorter time.

Let us apply these principles to tuberculosis. We know that many cases recover without having shown clinical symptoms of the disease. How does this recovery take place? Dr. Wright supposes that what he calls "auto-inoculations" occur from the foci of infection on active or passive movements of the body. In this way doses of the poison are introduced into the system in greater or lesser quantities according to the amount of exercise and the extent of the infection. These auto-inoculations set the protective mechanism of the body in motion, and the protective substances which we call antibodies are formed. When the response on the part of the body is not adequate, death is always the result. As Dr. Wright says:

"No one acquires protection against the disease save by the production of protective substances. . . . No one can live in the presence of infection save by the aid of these protective elements. . . . No one recovers from any bacterial disease unless it be by the production of protective substances in his organism."

Dr. Paterson applies these principles to the treatment of the disease.

The patients are given graduated exercise, and between the exercises absolute rest, as near as it is possible to obtain it, is insisted on. This goes to the extent of prohibiting talking, as it is well known that even talking will sometimes increase the temperature of a person suffering from tuberculosis. During the period of exercise the poisonous substances are introduced into the general circulation from the focus of infection. During the period of absolute rest this inoculation ceases and the body is enabled to form its protective substances. The formation of protective substances must always be in excess of the inoculation in order to produce good results.

Dr. Paterson's reports are very instructive. It cannot be said that the use of graduated exercise is a new thing in the treatment of tuberculosis. In fact, every one has employed it to a greater or less extent for many years, but not with the definite purpose suggested in this book. Dr. Paterson for the first time has used it as a therapeutic agent with a definite object in view. The periods of exercise correspond to the artificial injections of vaccines or tuberculins which we may give. The periods of rest correspond to the intervals between the injections during which the body is forming protective substances in response to the injections. The work is very suggestive and well worthy of careful study.

We must again consider the relation of bovine tuberculosis to human health, a subject to which two very important contributions have been made during the past year. The first is the final report of Drs. Park and Krumwiede. This report is a continuation of one made by the same authors in 1910. They give the following figures in their summary:

Of 63 children dying of tuberculosis at the Babies' Hospital, 59 cases proved to be human infection and 4 bovine, a percentage of 6⅓.

Of 9 children dying of tuberculosis at the Foundling Hospital, 4 proved to have derived their infection from human sources and 5 from bovine, a percentage of 55.

Of a total of 88 children under five years of age who died of tuberculosis, 77 proved to have derived their infection from human sources and 11 from bovine, a percentage of 12½.

Combining the cases studied in New York with those of other observers in different parts of this country and Europe, the following results are obtained:

Adults, 787 cases—777 human and 10 bovine infection.
Children, five to sixteen years, 153 cases—117 human and 36 bovine infection.
Children under five years, 280 cases—215 human and 65 bovine infection.

I would, however, call especial attention to the report from the Foundling Hospital in New York, where cow's milk is used exclusively. In this hospital 55 per cent. of those children who died of tuberculosis had received their infection from bovine sources. Dr. Park very justly says that there is no reason to suppose that New York is differently situated in regard to its milk supply from other large cities in this country. We are justified, therefore, in concluding that the percentage of deaths in other large cities of our country compares very closely with that of New York. Applying these percentages to the total death-rate from tuberculosis in the city of New York, Dr. Park concludes very conservatively that upward of 300 children die every year in that city from bovine infection. These percentages are based entirely on unselected cases.

Further than this, only fatal cases are considered in the above figures. The amount of disease due to bovine infection is unquestionably much greater than is shown by the number of deaths, as there are many cases of bone, joint, and glandular disease which disfigure the person and produce greater or less permanent injury without causing death.

Passing from Dr. Park's report, we have the final report of the British Royal Commission appointed in 1901. You will remember that in 1908, in Washington, Koch denied that the bovine tubercle bacillus produced pulmonary tuberculosis, and would not accept as correct the cases presented at that time for consideration.

The British Royal Commission have discovered two cases of pulmonary tuberculosis in which the bovine germ was isolated from the sputum after every precaution was taken. I quote from the report in full on this point: Page 12, Paragraph 11.

(See also Appendix, Vol. I, p. 9):

"The two cases which showed only bovine bacilli in the sputum deserve special notice. The cultures in these two cases grew like bovine bacilli on artificial media, and gave rise to fatal generalized tuberculosis in both calves and rabbits. There was no evidence of the presence of eugonic human bacilli in the sputum. One examination in these cases was not considered sufficient. From one of the patients, H. 127 'R. R.,' additional specimens of sputum were collected on three separate occasions at intervals of 76, 117, and 118 days after the collection of the first specimen. Cultures were obtained direct from the sputum. The investigation of these three specimens gave the same results as the first. The sputum yielded only bovine tubercle bacilli. From the other patient, H. 128 'D. D.,' one additional specimen was obtained 118 days after the first. This, like the first, yielded only bovine tubercle bacilli, which were isolated from the sputum direct and pro-

duced fatal tuberculosis in calves and rabbits. These two cases were therefore definite cases of pulmonary tuberculosis caused by bovine tubercle bacilli, and, as far as could be ascertained during life, they were cases of primary pulmonary tuberculosis. In neither of the patients was there any evidence of tuberculous disease elsewhere, such as disease of the cervical glands or of the intestinal tract when the sputum was collected."

Another question arises here which was discussed at our meeting last year by Dr. Welch and myself, namely, the possibility that the bovine bacillus may so change its characteristics by residence in the human body that it becomes impossible to make sure of its origin. Koch and others have held that such a change is improbable, if not impossible. I last year cited my own experiments, showing that the human bacillus could be changed in morphology, cultural characteristics, and virulence, so that it was identical with the bovine bacillus. I cited also the work of Professor Eber, of Leipsic, on the same point.

The British Royal Commission, in studying cases of lupus, found certain cultures which did not correspond entirely either to the human or to the bovine type. The question arose at once as to whether these cultures were or were not degraded types of the bovine bacillus. If we exclude the possibility of a change of type in the tubercle bacillus, it becomes necessary to assume that every case of lupus receives its infection from some preëxisting case of the same type, a supposition which is manifestly impossible. So far as known, all cases of lupus receive their infection from some preëxisting case of mammalian infection, either the bovine or the human bacillus. In order to gain some light on this question the British Royal Commission carried out experiments by passage through animals. I quote at length from their report, showing that it was possible to raise the virulence of these irregular types to that of typical bovine cultures (page 18, paragraph 26):

"In view of the above facts, and on a working assumption that the dysgonic tubercle bacilli found in lupus might be degraded bovine bacilli, it was sought to increase their virulence by passage through animals. Certain of the viruses were accordingly thus tested, the tissues of calves and rabbits being regarded as most likely to induce intensification of their virulence. These viruses were the six which are shown in the Table (2). One experiment with Virus H 100 'R. S.' may be quoted to illustrate the result obtained. The culture derived from the original material through a guinea-pig was injected subcutaneously into a calf (1409) in a dose of 100 mgm. The animal was killed in 119 days, and only a limited tuberculosis was found: a cyst at the seat of inoculation, a few tuberculous lesions in the nearest glands and in the lungs, and in a few lymphatic glands of the body—a result

very different from that which follows inoculation with 100 mgm. of a culture of bovine tubercle bacilli. A culture obtained from the mediastinal gland of this calf was inoculated into another calf (1543) in a dose of 50 mgm. This second calf was killed, when dying, in 34 days, and showed general miliary tuberculosis. Two other experiments with the same virus on similar lines, lasting respectively 73 and 122 days, gave like results. The cultures obtained from the passage animals in each series were also fully virulent for rabbits. In another experiment the virulence of Virus H 100 was found increased for the rabbit by residence for 337 days in the body of the rabbit. Apparently, therefore, residence in a calf for 73, 119, and 122 days of the bacilli obtained from the lupus lesion was sufficient to raise the virulence of the bacillus to that of the bovine tubercle bacillus, and residence in the rabbit for 337 days had like effect.

"Similar results were obtained with Virus H 108, 'H. R.'

"But in the cases of Viruses H 105, 'G. S.,' H 53, 'D. H.,' H 107, 'H. H.,' and H 85, 'H. B.,' the result was different; neither a single residence in the calf or rabbit, nor passage through a series of calves, led in these cases to an increase of virulence up to the standard of the bovine tubercle bacillus. In one case, however (H 105, 'G. S.'), the virulence for the rabbit was slightly increased by passage through the calf, and in another (H 53, 'D. H.a'), for the monkey, by passage through the monkey.

"To sum up the results obtained in these nine cases of lupus in which a bacillus was obtained presenting the cultural characters of the bovine tubercle bacillus, in only one case did the bacillus obtained from the original material possess the high virulence as well as the cultural characters of the bovine tubercle bacillus. The other eight viruses, though their bacilli exhibited and retained the cultural characters of the bovine tubercle bacillus, proved less virulent than that bacillus, not only for the calf and rabbit, but also for the monkey and guinea-pig. It was found possible in two cases to increase the virulence of the culture from the original material by residence in the tissues of the calf and rabbit, so as to bring it up to the high virulence of the bovine tubercle bacillus."

In studying cultures obtained from horses similar experiments were carried out. These I quote at length (page 23, paragraph 43):

"*Passage Experiments with Virus E II.*—Four separate passage experiments on calves were undertaken. (See Chart, Appendix, vol. iv, p. 105.) The first passage experiment was through calves, two series of these animals being tested concurrently, and lasted two and a half years. Cultures were used, the dose for the first animal being 10 mgm., while the succeeding calves received 50 mgm. each. As a result of the passage the virulence for the calf was perhaps increased slightly, but for rabbits it was definitely increased.

"The second passage experiment was carried out, like the first, through a double series of calves, and lasted two years and seven months. In one

branch of the experiment the virulence of E II for the calf became increased up to the standard of the bovine bacillus. In the other branch the virulence was not increased.

"The third and fourth passage experiments each included 4 calves, and lasted one year and four months and one year and seven months respectively. In both experiments there was an increase of virulence of E II up to the standard of the bovine tubercle bacillus.

"In parallel experiments on rabbits performed with each of the cultures isolated during the passage through calves it was found that the results obtained with the rabbits coincided with those obtained with the calves. The cultures which produced slight tuberculosis in calves had not the virulence for rabbits of the bovine bacillus, whereas those which killed the calves with acute tuberculosis killed the rabbits with acute disease. In one instance the culture obtained from one of the calves which died of generalized tuberculosis was found fully virulent for the monkey, while in another instance in which, at the end of the passage, the calf had only slight tuberculosis, the culture obtained from it was found not to be increased in virulence for the monkey. Throughout all the passage experiments the cultural characters of the bacillus remained unaltered. In one experiment a culture derived from a rabbit which had been inoculated with a culture from the original material of E II was found to have increased virulence for the calf, in which it produced severe generalized tuberculosis.

"44. *Passage Experiments with Virus E IV.*—Three passage experiments were performed, two of which were negative and one positive. (See Chart, Appendix, vol. iv, p. 123.) The first passage lasted two years and four months, and began with a dose of 10 mgm., injected subcutaneously into a calf. A culture from this calf, passed on in doses of 50 mgm. into other two calves, produced only slight disease. Cultures from each of these two calves passed on in a similar dose into each of two other calves also produced but slight disease.

"The second passage experiment lasted one year and seven months; a dose of 50 mgm. was injected in the first instance and the experiment was performed in the same way and with the same number of calves as before; it was also negative.

"The third E IV passage experiment lasted one year and seven and a half months, and began with a calf (502) which received 50 mgm. subcutaneously; only slight disseminated tuberculosis was produced in this animal. The culture isolated from the lung of this calf was passed on into two calves (630 and 614) in similar doses. One died in thirty-one days of generalized tuberculosis, the other in thirty-three days of pneumonia with some tuberculous lesions. Another calf (602) inoculated with a culture from the suprarenal body of calf 502 was killed in ninety days, and showed progressive but not severe generalized tuberculosis. The culture from this calf, injected in a 50 mgm. dose into another calf, killed the animal in thirty-nine days of generalized tuberculosis. The virulence of E IV for the monkey was also increased at the end of the passage."

I quote further experiments upon this same point in which nine separate viruses of human origin were used (page 33, paragraph 70. See also Appendix, vol. i, p. 55):

"In further experiments with the human tubercle bacillus nine separate viruses were used. With six of the viruses passage experiments were carried out on calves, the number of animals included in each experiment varying from two to seven, and the total duration of the residence of the bacilli in the calf's body varying from 247 to 512 days. There was no alteration in the characters of the bacillus at the end of the passage in any of the cases. After continued residence in one case for 484 days in the bodies of three rabbits consecutively, and in another 725 days' single residence in the body of one rabbit, the human cultures were found unchanged. Similar results were obtained in two experiments on the rat after residence in the one case for 454 days in the body of one rat, and in the other for 1614 days in the bodies of eight rats consecutively. Single residences in a cow for 529 days, in a pig, 378 days, a guinea-pig, 320 days, a dog, 413 days, produced no change in the characters or virulence of the cultures of the human bacillus.

"These particular experiments, therefore, failed to effect any modification in the bovine or human tubercle bacillus."

It will be seen that in this last series of experiments no change in virulence took place. What conclusion is to be drawn from these experiments? I confess that I am unable to give an exact answer. It has been demonstrated conclusively that certain cultures may be raised in virulence so that they resemble the bovine in this and in all other respects. Are we then to suppose that only those cultures which we succeed in changing in this respect were originally derived from bovine sources? This does not seem a tenable proposition. However, if it is true, it proves that the bovine bacillus can and does undergo what may be called retrograde changes and approaches the saprophytic type. There is here a fertile field for further experimentation. It has not only an academic, but a practical, value. Personally, I do not hesitate to express my belief that the tubercle bacillus, from whatever source, may be changed in its characteristics by the influence of the soil in which it grows.

I would once more emphasize my belief that this question, from beginning to end, can be determined only by careful laboratory work. Clinical reports, in my opinion, are valueless. As a proof of this I would call your attention to the fact that for years the leading men of New York city stated that the bovine tubercle bacillus was not dangerous to children, and I believe that they exercised no precautions whatever in this respect in selecting milk for the feeding of babies. I have given you above the results of the investi-

gations made by Dr. Park in that city, showing that upward of 300 children die every year from bovine infection. This has proved that these men were absolutely wrong, and entirely incapable of telling the difference clinically between bovine and human infection. For this reason I have not gone into consideration of the report of a collective investigation made in Germany by correspondence concerning the danger of milk from tuberculous cattle. I consider it as of no value whatever in settling this question. Again I repeat that only careful laboratory work is capable of giving correct information concerning this matter.

I once more quote from the report of the British Royal Commission (page 13, paragraph 18):

"Of the total of 108 cases of human tuberculosis investigated, 84 yielded human tubercle bacilli only, 19 yielded bovine tubercle bacilli only, and 5 both bovine and human tubercle bacilli. Although the bovine tubercle bacillus may, as it appears, be solely responsible for certain cases of pulmonary tuberculosis (consumption), and though it may be present with the human tubercle bacillus in the bronchial glands, it is evident, from the data recorded, that the majority of cases in which the bovine tubercle bacillus is the infective agent in the human being are cases of alimentary tuberculosis. Such are cases of cervical gland and primary abdominal tuberculosis. In the latter class of cases at least the tubercle bacillus has unquestionably been swallowed. Received in this way, the tubercle bacillus, whether human or bovine, may pass through the pharyngeal or buccal mucous membrane and infect the cervical glands, or, getting into the small intestine, it may produce several different lesions, such as ulceration of the gut, tuberculosis of the mesenteric glands attached, and of the peritoneal covering. The percentage of these cases of alimentary tuberculosis due to the bovine tubercle bacillus is very large. Taking both classes of cases (cervical gland and abdominal) together, numbering 38, there are 17 in which the bovine bacillus alone was found, 19 in which the human bacillus alone was found, and 2 in which both were found. Taking the primary abdominal cases alone, it is seen that in 16 out of 29 the bovine bacillus was found; in 14 of these it was the sole infective agent present."

Page 40, paragraph 77:

"Meanwhile we, in view of the evidence adduced by us, regard ourselves as called upon to pronounce on administrative measures required in the present for obtaining security against transmission of bovine tubercle bacilli by means of food. In the interests, therefore, of infants and children, the members of the population whom we have proved to be especially endangered, and for the reasonable safeguarding of the public health generally, we would urge that existing regulations and supervision of milk production and meat preparation be not relaxed; that, on the contrary, Government should cause

to be enforced throughout the kingdom food regulations planned to afford better security against the infection of human beings through the medium of articles of diet derived from tuberculous animals.

"More particularly we would urge action in this sense in order to avert or minimize the present danger arising from the consumption of infected milk. And in this connection it may be convenient for us to repeat certain facts observed by us in reference to the conditions tending to the elimination by the cow of bovine tubercle bacilli in her milk—facts in our opinion of such importance that they formed the subject of our Third Interim Report.

"Bovine tubercle bacilli are apt to be abundantly present in milk as sold to the public when there is tuberculous disease of the udder of the cow from which it was obtained. This fact is, we believe, generally recognized, though not adequately guarded against. But these bacilli may also be present in the milk of tuberculous cows presenting no evidence whatever of disease of the udder, even when examined postmortem. Further, the milk of tuberculous cows not containing bacilli as it leaves the udder may, and frequently does, become infective by being contaminated with the feces or uterine discharges of such diseased animal. We are convinced that measures for securing the prevention of ingestion of living bovine tubercle bacilli with milk would greatly reduce the number of cases of abdominal and cervical gland tuberculosis in children, and that such measures should include the exclusion from the food supply of the milk of the recognizably tuberculous cow, irrespective of the site of the disease, whether in the udder or in the internal organs."

In conclusion let me say, as I have said so often before, that the facts which we now have before us force the conclusion that bovine tuberculosis is a real menace to human health. It makes no difference whether only one person in one thousand or one in ten thousand dies from bovine infection—I feel that they are entitled to protection just as much as though their numbers were greater. It is our duty, both as an association and as individuals, to urge the passage of laws protecting citizens from this danger. It is also our duty to obtain health officers who will see that such laws are carried out. Our Association has done great work throughout this country in disseminating information concerning the modes of spread of the disease, and last year it took a decided stand in regard to the danger from bovine tuberculosis. Let us continue this campaign and protect people from every source of infection. This can be done only by recognizing the bovine source of the disease as well as the human.

REPORT OF THE EXECUTIVE SECRETARY

By Livingston Farrand, M.D.
New York

In presenting an outline of the Association's activities during the year just past, and a survey of the conditions as they exist in the country, it is a source of satisfaction to record once more a period of unabated interest in the campaign and of unbroken progress toward the national equipment against tuberculosis which we have set as our goal.

At the time of the last annual meeting the Southern Exhibition, which has been operating for some years past under the direction of Mr. E. G. Routzahn, had just closed its work in Mississippi. In the judgment of the Board of Directors of the National Association this exhibition had practically completed its specific task, and it was therefore dispersed early in the autumn. Since that time Mr. Routzahn has been acting as a field secretary engaged in visiting those States where exhibitions had previously been held and co-operating with such committees and associations as have been formed in that section during the past five years. In pursuing this work Mr. Routzahn has visited the chief centers in the States of Mississippi, Tennessee, Indiana, West Virginia, Virginia, North Carolina, South Carolina, and Georgia and is still engaged in the task.

At the time of the last report the Western Exhibition, under the direction of Mr. Walter L. Cosper, had just closed a successful campaign in the city of Butte, Montana. During the year this exhibition has operated in the Northwest and West, campaigns having been conducted in the cities of Billings, Helena, and Great Falls, Mont.; in Aberdeen, Pierre, and Sioux Falls, S. D.; and in Cheyenne and Laramie, Wyo. Mr. Cosper is now engaged in making a preliminary survey of conditions in Nevada and neighboring States, with a view to subsequent operations in that section.

It is expected that, as in the case of the Southern Exhibition, the Western Exhibition will have completed its specific work during the coming year. It is hoped then that a systematic plan of field operations may be inaugurated by which a trained representative can be sent from point to point as

the demand may indicate, to give such help and advice as may be possible, both in organizing new agencies and in assisting associations already in the field.

The work of the Bureau of Publicity, under the direction of Dr. Philip P. Jacobs, has been actively pushed along its well-tried lines during the year just closed. The regular fortnightly bulletin has been issued as usual, and this service, which forms the basis of our press activities, has now grown until 8500 newspapers in all parts of the United States are regularly supplied with the service. During the year 195,000 bulletins have been so distributed. It is a pleasure to acknowledge again the cordial co-operation of State and local associations in furthering this particular phase of the educational movement. A large proportion of the press bulletins are sent out through our affiliated organizations, and they alone render possible the success of this work without a prohibitive expenditure of money.

The Association is also under continued obligation to practically all the leading press associations and syndicates in the country, notably the American Press Association, The Western Newspaper Union, The Associated Press, the United Press, the International News Service, the Publishers Press, the Laffan Bureau, and other similar organizations. Many of these agencies, besides aiding in the distribution of our regular material, give much space to special articles and editorials which are prepared in the office of the National Association from time to time.

In an effort to bring the affiliated societies more closely into co-operation, a Confidential Bulletin is now issued regularly and distributed to all the societies, which now number nearly 700. This bulletin is issued monthly and attempts to treat of such topics as are of particular interest and importance to those engaged in local campaigns. It is expected that this will be continued and be further developed as future needs may indicate.

Mention should also be made of the preparation and issuance of a standard lecture with a set of colored lantern slides carefully prepared, and which can be sold at cost. The particular object we had in view in preparing this lecture and set of slides was to present something which could be used by any one, whether expert or not in this particular field. Already nearly one hundred of these sets of slides and lectures have been sold, and it is being used regularly in certain moving-picture theaters and similar places where the public can be reached in large numbers.

The success of Tuberculosis Day in 1911 indicated the desirability of repeating that educational effort this year. Preliminary plans were made and the date was set for April 28th. Just as the first definite publicity effort

was being initiated it was learned that the same day had been chosen for a similar purpose by the Men and Religions Forward Movement. After careful consultation with the authorities of that organization, and in view of the particularly close relation between that movement and the churches of the country, it was decided to postpone Tuberculosis Day at least until autumn, and to choose some date which would be free from such conflict. We are now in correspondence with our various affiliated societies with a view to determining the most favorable date for the purpose.

Mention should also be made of the increasing inportance of the moving picture in the field of public social education. The use of this device in the Red Cross Seal campaign of 1910 is familiar to all, and a similar film was prepared and widely distributed for use last year. Other correlated movements both in the field of public health and other phases of social betterment have seized upon the idea, and every effort is being made to engage the wider co-operation of manufacturers and proprietors of moving-picture theaters, particularly in public health work. Owing probably to the priority of the tuberculosis movement in this field, we have been forced to act as advisers and as a general clearing-house of information on the subject. As a consequence, a special circular relating to public health moving-picture films was prepared by the Edison Company and supplied to the National Association for free distribution.

It is inevitable with the growth of this movement in the United States that the general correspondence of the National Association should constantly increase, and this is true to an extent which taxes the facilities of the executive office even with such increases in the force as have been made. One of the most interesting and stimulating phases of this aspect of the work is the number of communications from foreign countries which are received asking for aid and suggestions in planning campaigns against tuberculosis. Two years ago mention was made of the inauguration of an educational campaign in China, resulting partly from the preparation of a special circular of information prepared by the National Association for use among Chinese students in the United States. Since that time we have been in constant correspondence with those in charge of the work in China. We have only recently been informed of the wide extension of that campaign. Similar results have been obtained in Japan and more recently in certain South and Central American republics, while the regular correspondence now reaches as far as Australia and New Zealand, and, of course, practically all the countries of Europe.

The Bureau of Construction, under Dr. Thomas S. Carrington, has con-

tinued its active co-operation with committees charged with the construction of hospitals and sanatoria in various parts of the country. Since the last report the Bureau has assisted in the preparation of plans for the construction of 42 institutions, and Dr. Carrington has also personally inspected over 50 sites proposed for such establishments. The collection of plans now available for consultation in the office has been much enlarged and is being frequently utilized by architects and others interested.

In response to the great number of requests for definite and detailed information regarding methods of outdoor living and sleeping, not only for those who are suffering from tuberculosis but for those who wish to provide such facilities as a preventive measure, Dr. Carrington has prepared a volume entitled "Fresh Air and How to Use It," the printing of which has been authorized by the Board of Directors and which will appear in the course of a few weeks. It will form a volume of some 250 pages, and will, it is expected, meet a wide demand.

Dr. Carrington has also actively co-operated during the year with a special committee appointed by the School Hygiene Association to make a study of the entire subject of ventilation. With the increased attention which is now being given to this difficult subject it is hoped that the immediate future will witness a thoroughgoing investigation of the problem under the best auspices.

Owing to the increasing number of inquiries which are constantly reaching the office relating to opportunities for work either in institutions or in connection with anti-tuberculosis associations, as well as requests from such institutions and associations to suggest possible individuals to fill vacancies, it has been found necessary to systematize our records in this field and the executive office will be grateful for the co-operation of all those engaged in any aspect of tuberculosis work in making this service as efficient as may be.

At the time of the last annual meeting there had just been issued the new edition of the Tuberculosis Directory, as well as the volume on Tuberculosis Hospital and Sanatorium Construction. The Directory has been widely circulated, and the volume on construction has been particularly successful. An edition of 3000 copies of the latter work was printed, of which 2700 have already been sold or distributed. It is interesting to note that of this number some 870 were ordered by architects or other directly interested in the construction of specific institutions. The publication of the Transactions of the last annual meeting was unfortunately delayed far beyond the date originally set for its appearance. The desired material was, however, finally obtained and the book was distributed to members a short time ago.

It is hoped that the report of the present meeting will meet with no such obstacles and can appear in the early autumn.

As is already familiar to many of our members the organization of the Red Cross Seal campaign last year was changed in such a way that the National Association was appointed national agent for the seals and undertook not only the appointment of the state and local agencies, but all the business connected with the administration of the sales. For this purpose a special office was opened in Washington, with Mr. Robert C. Sanger in charge, and an active campaign was inaugurated.

In spite of serious obstacles the sale was a decided success, the total number of seals sold exceeding 32,000,000. Special mention should be made of the extraordinarily cordial assistance that was given not only by the magazines and newspapers of the country in advertising the seals, but by other agencies controlling important avenues of publicity. Perhaps no assistance was more valuable than the street-car advertising which was freely given to the National Association for this purpose; 28,300 cards were placed in street-cars in all parts of the United States. The value of this single item alone is estimated at $150,000.

While it is obvious that the primary aim of the Christmas Seal movement is to provide funds for the prosecution of local anti-tuberculosis campaigns, the educational opportunity afforded is being utilized to an increasing extent and further use will be made of it during the coming season.

The Association may be interested to learn that arrangements with the National Red Cross have again been concluded by which the National Association will act as a national agent for the coming year, and we are also glad to report that the percentage of gross receipts to be paid by local agents to the National Red Cross has been reduced from 12½ per cent. to 10 per cent. with a further reduction for sales by any agent exceeding 2,000,000. As was the case last year, any balance remaining after the central expenses of the campaign have been met from the percentage paid to the National Red Cross will be divided equally between the National Red Cross and the National Association.

It is a pleasure to acknowledge not only the very great importance of the moneys derived from the sale of these seals for the local campaigns throughout the country, but to acknowledge particularly the very cordial attitude of the National Red Cross in all negotiations concerned with the movement.

It is also a pleasure to acknowledge and record once more the obligation of the National Association to the Russell Sage Foundation for the continued

support which has made possible the field campaigns and to a large extent the operations of the Publicity Bureau of the Association.

The number of members of the Association to date is 2132.

In presenting a brief general survey of the growth of the anti-tuberculosis movement throughout the country, no better means presents itself than a comparative statement of the number of institutions and organizations of various types that have been brought into being during the year just closed.

With regard to associations for the prevention of tuberculosis there were, a year ago, 511 in affiliation with the National Association. There are today 660, being an increase during the year of 149. These now cover every section of the United States and present an organized body of workers of really stupendous proportions.

Of tuberculosis hospitals and sanatoria there were a year ago 422 in existence, whereas today we have record of 466, an increase of 42 during the year.

Of special tuberculosis dispensaries there were a year ago 342, while today there are 373, being an increase of 31.

Particularly notable also has been the growth in the number of outdoor schools, of which there are now 95 of which we have record. When it is remembered that the first of these schools was opened in 1907, the rapidity of the development is obvious.

The great growth of our campaign produces inevitably a corresponding complexity, and it is difficult to single out special aspects for particular mention. I think, however, that possibly the most important development of the past year has been in the field of special tuberculosis legislation.

From the very foundation of the National Association we have laid particular stress upon the necessity of adequate laws relating to this disease. Beginning with our campaign for compulsory notification, we have gradually increased our demands, although never to the point which expert knowledge and the logic of the situation would indicate.

A review of the legislation in the United States, such as that contained in the last edition of the Directory, makes evident the effect of the campaign of education upon public opinion as expressed in the enactments of various legislatures and local authorities.

It has remained for the last year, however, to offer certain samples of legislation of particular interest. In this field there can be little doubt that the State of New Jersey has adopted the most advanced legislation now on our statute books. As is familiar to many of you, that State having previously enacted a law permitting counties to establish special tuberculosis

hospitals has within the last few months passed a new law compelling counties to establish such hospitals and granting a state subvention of $3.00 per week for each patient cared for in such institutions. The law further provides for the compulsory segregation and detention in such hospitals of cases which may be adjudged dangerous to the public, and places the general responsibility for carrying out the provisions of the law upon the shoulders of the State Board of Health. Taken in connection with a law passed a year previously, whereby a special fund is voted to the State Board of Health for the prosecution of an educational campaign against tuberculosis, the State of New Jersey is now in a better position than any other commonwealth in the country to demonstrate the efficacy of preventive measures against this disease.

Notable legislation has also been adopted in Massachusetts providing for the compulsory establishment of local tuberculosis facilities and for State aid in the maintenance of patients therein. The State of Wisconsin has also adopted a permissory county hospital law, and provides for State aid to institutions founded under its provisions. The State of Kentucky has recently provided for the establishment of a tuberculosis commission, with a fund of $5000 a year to prosecute an educational campaign in that commonwealth.

Without citing other instances, it is perfectly clear that the advance in this field of special legislation is most notable, and it is upon this aspect that the National Association is laying particular stress at the present time, and will probably continue so to do in the immediate future.

Mention should also be made of certain examples of effective co-operation with organized labor in the campaign against tuberculosis. As is known to every worker in this field, the problem as it presents itself in manufacturing communities is particularly baffling of solution. Suggestive experiments have been tried in various centers during past years, and more lately the cities of Chicago and Buffalo have made striking advances in attacking this problem. Their example is already being followed by other communities, and we may confidently look for a more intelligent co-operation with organized labor in the immediate future.

While recognizing that in order to obtain the best results it is necessary to concentrate attention upon particular social problems, the leaders in this anti-tuberculosis crusade have never lost sight of the fact that the war on tuberculosis is only one phase of the great movement in the direction of public health in general. The truth of this becomes more and more obvious to the public as time goes on, and the machinery which has been

created for fighting tuberculosis is being looked to more and more as a model for the organized attack on other diseases and as a possible center about which other public health activities may group themselves. In certain localities anti-tuberculosis associations have already been extended into public health associations, and we are being called upon more and more to fulfil our obvious function as a factor in this campaign, which touches every point in the moral, economic, and social life of the people.

ADVISORY COUNCIL

Chairman

CHARLES O. PROBST, M.D.

Columbus, Ohio

SHOULD THE PREVENTION OF TUBERCULOSIS BE UNDER EXCLUSIVE OFFICIAL CONTROL?

By C. O. Probst, M.D., *Chairman*
Columbus, Ohio

Most of you, no doubt, have seen by the evening papers that Ohio has just lost one of her most distinguished citizens. The heads of many foreign nations and the highest dignitaries of his own country, took delight in paying him tribute. We may well feel proud that to one of our countrymen, to Wilbur Wright, the world owes the flying machine.

But consider the cause of the death of this genius, just reaching his prime—*typhoid fever.*

Dr. Rush is reported to have said that when a person died of typhoid fever, some other individual deserved to be hanged for criminal carelessness. Certainly we all admit that this disease is preventable; and it is to our disgrace that we do not prevent it.

And this other disease, tuberculosis, that brings us here tonight, is also preventable, and some day it may be said that we must have been barbarians to have permitted to continue conditions which we knew were responsible for the unnecessary death of millions of our fellowmen.

Have any of you seen or worked on a water line in putting out a fire?

In former days, in small villages without waterworks or a fire department, it was a point of honor, as well as a matter of self-protection, for all able-bodied, good citizens, men and women, to rush to the fire at the ringing of the bells.

A water line would immediately form, leading from the nearest well or cistern, and the filled pails and buckets, brought from many homes, would soon be rapidly passing from hand to hand to the house on fire. Strong arms would be working the pump. At the house end of the line, when the fire had started in the loft, the buckets would be hoisted by men clinging to a ladder to where others, through holes cut in the roof, could apply it to the fire's starting point.

Women and children, with men for the heavy articles, were carrying

out the household goods. Often other water lines were extended to houses next door where those on the roof kept wet the sheets and blankets, sprinkled with salt, to protect the dry shingles against the thick-falling sparks from the burning building.

One who has never experienced the keen pleasure of winning the battle in this personal combat against this home-destroying monster, fire, has missed something in life.

The fire department has now almost everywhere taken the place of such mutual aid organizations. We pay a body of trained men, always on the watch, to protect us against such losses.

Before the creation of health boards and health officers, when pestilence appeared, the stoutest hearts, but always under the direction of the doctor, were banded together to nurse and feed the sick, to bury the dead, and to maintain something like quarantine to protect the living. Now everywhere men are paid, miserably paid as a rule, and therefore usually untrained, to protect us against such danger.

But the great Pestilence, "the pestilence that walketh in darkness," goes on but slightly checked; and we meet here to-night to consider how the forces already at work for its extinction may best co-operate.

It occurred to me that the theme might be extended and consideration given to whether these forces, the health official, the physician, and the layman, are to remain in the field until this great work is accomplished, if that be possible, or whether, as in guarding ourselves against smallpox, cholera and yellow fever, the work cannot be more efficiently and more economically done by turning it all over to those who may be specially trained and paid for such services.

Leaving to the speakers of the evening the presentation of plans for closer co-operation of the three classes of workers they are to represent, your Chairman would briefly consider this other phase of the subject.

While I am of the opinion that the eradication of tuberculosis should be considered the duty of all governments, and that much if not all the work now being done to this end should ultimately be in the hands of trained health officials, aided by all helpful governmental agencies, there are many reasons to be urged why this, even if possible, should not be done now. Conditions may remain such that it will never be desirable. A radical change in the viewpoint of the functions of government, however, from which the protection of the life and health of the individual shall come before security of property, may bring this about.

While writing this paper my attention was attracted to the following

planks from the recently published platform of a Member of Congress from Ohio, upon which he desires to stand as a candidate for our next Governor, and which illustrate in a striking manner the recognition given to the newer demands upon government.

"Party platforms should be written and adopted as a sacred contract with the people, and every promise made should be kept. Any public official violating his platform pledge should be subject to removal."

"Workmen's compensation, state insurance, inquiry into infant mortality, and other matters designed to better humanity are properly receiving the attention they deserve. The man, the human unit, has a place in legislation before his chattels. Conservation of the race is first in importance. The property of man, his flocks and crops, have in too many instances claimed greater governmental care than has been given to the basic thing of life itself. I earnestly favor the lodgment of power within the legislature to pass such humanitarian laws as the progress of the race requires."

Governmental schemes are now being tried or considered in many countries, notably in England and Germany, to protect the individual against poverty. If this, which seems now wholly impossible, could be brought about, that alone would largely solve the tuberculosis problem.

The inherent nature of tuberculosis removes it from the class of most other preventable diseases. The discovery of its specific cause has helped only to a limited degree. The manifold contributing causes to be dealt with constitute the chief reason why we cannot at once turn over to the health authorities its prevention, as we have other plagues that were once so prevalent. It is for this reason that we must still hold together, and seek for closer co-operation of, the forces already enlisted.

Although the layman has been designedly placed last upon our program, he easily comes first, in my estimation, in what has so far been accomplished in the prevention of tuberculosis. Not only has he largely contributed the funds that have made possible much that has been done, and has urged on public authorities to greater activities, but he has often been the leader in many of the different movements that are directly or indirectly concerned in the control of tuberculosis.

Some one has said that cholera has been the means of saving millions of lives. Its awful ravages, spectacular on account of the rarity of its visits, forced improvements in health requirements, especially pure water, that health officials had been unable to bring about.

They had for years urged upon the people of Hamburg that to drink water laden with filthy sewage kept typhoid fever endemic and opened the

gates to even a worse enemy. Their cholera epidemic of 1892 has already paid back the lives it cost by forcing a pure water supply, and will go on for all time as a life-saving measure.

The slaughter of the innocents in the Collinwood fire will doubtless save many lives, while the Titanic disaster, we may hope, was no useless sacrifice, and that those who so nobly died did not lose their lives in vain.

Tuberculosis has its lesson. If its ravages of a hundred years could be crowded into one, is there any price the ones who were left behind would not pay to banish such a monster?

If there be a guiding hand that is to lead humanity to a heaven on earth, can we conceive of a means so well adapted to correct the social and industrial evils that beset us, as Tuberculosis? The two great plagues, the "white" and the "black," viewed in this light, become mighty forces for our ultimate salvation.

The very nature of these diseases has made their official control impossible. Their purpose, if all things have a purpose, we might well believe, is to scourge society into a mighty co-operative effort for the protection of future generations.

What, so much as these, has joined the laymen to the world-wide organized movements to fight health-destroying conditions and to give protection to those to come after against the unnecessary evils that afflict us? What, so much as Tuberculosis, is forcing radical changes and improvements in schools, in housing conditions, in workshops and factories, in prisons and reformatories, in child-labor, in healthful recreation, and in most of the many organized efforts of recent growth for mutual protection and betterment?

And we have been made to see, as never before, how our social enemies are linked together against us. Tuberculosis begets poverty, and poverty leads to tuberculosis and many other evils. Industrial crimes pave the way for either or both.

Mighty changes must come about before this arch enemy, Tuberculosis, can be laid low. And how could we expect such things to be made possible without the aid of such societies as this? How could we expect health officials alone to control a disease whose roots are so deeply entwined in our whole social and industrial fabric?

Nevertheless, it has seemed to me that many of the necessary reforms can be reached only by legislation and governmental control. The active educated lay-workers in tuberculosis, whose vision now takes in the whole field of prevention, could, if united, force legislative measures which health

officials acting alone could never obtain. The layman's fight against tuberculosis has helped, and will in a much larger measure hereafter aid, government officials to control unnecessary disease in all its forms and work along much broader lines for health protection.

For the eradication of tuberculosis we need the active support of National, State, and Municipal Governments; and it would seem to me wise that they should be in official control in the sense of directing, systematizing, and co-ordinating the work for its prevention. Its final eradication should be a governmental problem to be worked out by the government along all possible lines.

Generous appropriations should be made to this end by the Nation and by every State and large municipality. Naturally, the control of such funds would be by officials of these respective divisions of government. Logically, this would be the health officials, but candor compels me to say that this would mean at present, in many cases, placing money and authority in incompetent hands.

It is just here, however, that perhaps the greatest good will come from having laymen as active workers in the campaign against tuberculosis. Their association with health officials in this work has shown them the weak spots in our present official health system, and this may lead, let us hope, upon their demand, to the placing of all health protective agencies in the hands of specially qualified sanitarians with adequate funds and power for this, the most important function of government.

With this accomplished, the layman will no doubt be ready to turn his attentions to new fields of endeavor that will be found waiting his cultivation.

In the mean time, while pushing on the work along sociological lines and the elimination of sources of infection, our members devoted to laboratory investigation may find what many regard as the ultimate solution of the question—a method for artificial immunization.

In a recent conversation with our beloved first President, Dr. Trudeau, who still retains all his youthful enthusiasm of heart and brain, he said he had not abandoned all hope that Science would yet give us something that could destroy the active agent of tuberculosis without harm to the body. In this way he sees at least the possibility of our ultimate protection against this great destroyer.

While no one may venture to predict what great boons to humanity Science still holds in her hands, we must press on along established lines, and for the present, at least, hold fast to all the agencies now enlisted in this holy crusade.

THE RELATION OF THE HEALTH OFFICIAL TO THE ANTI-TUBERCULOSIS CAMPAIGN

By J. H. Landis, M.D.
Cincinnati

"What can the Health Officer do in the Anti-tuberculosis Campaign?" is a question claiming the time and attention of every man engaged in public health work.

With the cause, methods of dissemination, and means of prevention known, the results obtained, while noticeable, are not such as to provoke outbursts of unrestrained enthusiasm on the part of the Health Officer. Possibly too much has been expected by those engaged in the work. The chronic nature of the disease renders brilliant results, like those resulting from the substitution of a pure for a polluted water supply, impossible.

Almost any one can be relied upon for a short, sharp fight of a few days or weeks, but it requires a vast amount of patience to keep eternally vigilant year after year.

If tuberculosis killed with the swiftness of the acute infections, the problem presented for solution would be as simple as controlling smallpox or typhoid fever. With an average duration of nearly three years, and with the patient actively infectious a major portion of this time, the difficulty of breaking the chain of infection becomes evident.

The methods to be used by the Health Officer will vary with conditions as they exist in different cities and as they exist in different parts of the same city. In one, the predisposing cause may be faulty home conditions, and in another, faulty workshop conditions.

Irrespective of conditions, the method employed, to be of any value, must be based on a knowledge of the cause and methods of dissemination, a knowledge of how to neutralize the conditions, and continuous, persistent application of the remedy.

Notwithstanding the fact that a vast amount has been done to educate the public on the subject of tuberculosis, an appalling state of ignorance still prevails. Many people are so constituted that they are unable or

unwilling to believe what they cannot see. Exact information of a scientific nature on any subject is necessarily limited to a few people.

What is known about tuberculosis has been acquired within recent years. That it should make slight impression on the stone wall of ignorance built throughout the centuries is a fact too often lost sight of by those informed. It requires a generation for the dissemination and general acceptance of some fact, capable of absolute proof within a few days' time in the laboratory. In the education of the general public, the Health Officer must necessarily take a prominent part. In a city of any considerable size this work is of sufficient magnitude to occupy the entire time of one man.

A general plan of campaign must be varied to meet the needs of those in the audience to be instructed.

Last July, in Cincinnati, the Health Officer, in a series of addresses, invited the co-operation of the labor unions to improve workshop conditions. Committees were appointed by the unions, which meet with the Health Officer at intervals, and a plan of work has gradually been evolved.

In the beginning, the aim was to have a man on each floor of every workshop and factory, whose duty it was to report on the sanitary conditions. A form was furnished containing inquiries designed to develop information as to the time and method of sweeping, the method of ventilating, the presence or absence of spittoons, the possible presence of an employee with a chronic cough, etc.

Progress has been slow, the same old stone wall blocks the way, but a little has been accomplished.

A Board of Health regulation has been passed requiring the employer to furnish spittoons. In a limited number of cases (all of those reported) employers have eliminated unsanitary conditions. In no instance has the department met with active opposition from the employer.

The chief difficulty has been in arousing active interest on the part of the employees. This may be due to the fear of dismissal, possibly to some other reason.

At present we have under discussion a plan to create a roll of honor on which will appear the names of those employers of labor who improve the sanitary condition of their workshops. This roll of honor will be published in the papers devoted to the interests of labor unions.

Another plan under discussion is to have the unions employ a visiting nurse, whose duty it shall be to visit the homes and educate the members of the family in preventive measures.

Local morbidity and mortality statistics are being secured from the

different trades for the purpose of demonstrating the cost to the union in the way of sick benefits and death benefits, due to the disease.

The plan contemplates, a little later on, an actual demonstration to the employer of the increased efficiency due to improved sanitary conditions and the losses sustained due to disability of workmen.

It is our belief that the most convincing arguments are those based on the financial losses sustained and a demonstration of the possibility of transforming a liability into an asset.

The business world works with money, figures in dollars, takes out its papers of incorporation in Missouri, and has "to be shown." Show it that substituting a pure for a polluted atmosphere means increased efficiency without a corresponding increase in the cost of production, and one of the greatest predisposing causes of tuberculosis will be eliminated, and a powerful factor in the fight for its suppression will be enlisted.

Surveillance over the disease becomes effective in proportion to the number of cases reported, compared with the total number of cases existing in the community.

To be complete, it must embrace all forms of tuberculosis. Reporting pulmonary cases and ignoring those implicating bones, joints, and glands would be very much like reporting pharyngeal cases of diphtheria and ignoring those of the laryngeal and nasal type.

It follows, then, that the Health Officer becomes effective in his campaign in proportion to the thoroughness with which he secures a full report of all types of the disease.

In 1911, 91.7 per cent. of the deaths in Cincinnati due to all forms of tuberculosis had been reported previous to death. As a considerable number of those not reported belonged outside of the pulmonary type, the Health Board amended the regulation requiring the reporting of tuberculosis by striking out the work "pulmonary."

Recognizing the danger of contact-infection in the various institutions furnishing homes for the indigent public and the creation thereby of a chronic source of infection for the general public, the Board of Health of Cincinnati, on February 21, 1912, issued the following:

"A General Order from the Board of Health of Cincinnati, Ohio, to all hospitals, orphanages, clinics, jails, asylums, infirmaries, correctional and eleemosynary institutions furnishing homes for the *indigent public.*

"Cincinnati occupies an unenviable position among her sister cities as a tuberculous center.

"The economic loss in lives, invalidism, medical and nursing expenses, cost of maintaining public institutions, and providing relief through the various public, private, and religious organizations, amounts each year to more than the entire cost of maintaining the City and County Government.

"The cause and method of transmission of tuberculosis are known and its transmission from the sick to the well can be prevented.

"RESOLVED by the Board of Health of Cincinnati:

"That all hospitals, clinics, orphanages, jails, asylums, infirmaries, correctional, and all eleemosynary institutions furnishing homes for the indigent or semi-indigent public be required—

"1. To report to the Department of Health of Cincinnati the name, age, sex, and such other information as may be required of every tuberculous case coming under their care.

"2. That they make proper provision for the segregation of all cases of tuberculosis admitted.

"3. That they make proper provision for the segregation of all tuberculous cases admitted for the treatment of some intercurrent condition or illness.

"4. That they make provision for the collection and destruction of all sputum or other infected discharges from the body.

"5. That these arrangements shall meet with the approval of the Department of Health of Cincinnati.

"6. That the Health Officer and his assistants be directed to furnish aid in discovering tuberculous inmates in any of the above institutions.

"7. That all institutions within the jurisdiction of the Department of Health of Cincinnati be furnished with a copy of these resolutions and be required to report back to the Department of Health, within ten days of the reception thereof, the plans adopted to carry into effect the above resolutions."

The effect of this general order has been to give the Health Department surveillance over some hitherto unreported cases.

In one correctional institution, maintained by a religious organization, which has had an abnormally high morbidity rate from the disease in the past, and in which the Department's offer to assist in detecting cases was accepted, four early-stage cases out of three hundred people examined were discovered and are now properly segregated.

The tendency in general has been to co-operate with the department, and when it becomes generally known that each case properly segregated means the breaking of a chain of infection, the result in the total number of cases reported should make a decided impression in the course of a short time.

The spread of tuberculosis will never be controlled until the same

methods of segregation are employed which have been effective in controlling the spread of other contagious diseases.

Permitting children to contract contact-infection and later on become public charges is a grave injustice to the children and a serious reflection on the intelligence of the public. Contact-infection in the home, probably more nearly than any other method, describes the unbroken chain coming down from the first case that occurred away back when the world was young.

The objections to segregation are based chiefly on the multitude of cases needing it. That it is the chief remedy to be applied no one can doubt who has watched one member of a family after another fall victims to contact-infection.

District physicians on full time will mean an agency for the discovery of unrecognized incipient cases at a stage of the disease when recovery can be expected.

In Cincinnati, where district physicians will devote all their time to the work of the department after July 1st, it is proposed to make a tuberculosis survey of the entire city. Cases reported to the department will be used as guides to other cases in the same family, and these cases will be referred to the family physician for treatment.

There is every reason to believe that this method will result in a decided curtailment of second- and third-stage cases.

The Health Officer and his assistants can instruct school children, mothers' clubs, factory hands, and others in the beneficial results of pure air as a preventive.

One great truth seems to have failed to impress itself upon the public, and that is that the time to contract the fresh-air habit is before, not after, tuberculosis has developed.

In Cincinnati a nurse supplied by the anti-tuberculosis league devotes all her time to lecturing before school children, mothers' clubs, and working men and women.

The good results obtained in the open-air schools and open-window schoolrooms suggest an extension of the system to the point where all schoolrooms are open-window ones. If this system will cure anemia and arrest tuberculosis, it will prevent the development of both conditions. The time to begin open-window systems of school teaching is before, not after, anemia or tuberculosis has developed. "The last word" in school construction today will probably be considered obsolete within the next ten years.

The Health Officer can organize and direct the efforts of the various

organizations brought in contact with cases from day to day through their social workers.

Such an organization has been effected in Cincinnati during the past three months. Its object is to secure a uniform method of instruction to the patient and his friends, to secure a uniform method of reporting cases, and to avoid duplication of effort on the part of organizations.

According to the opinion of ex-City Solicitor Ballard, of Cincinnati, vicious consumptives may be removed forcibly to a hospital and detained forcibly. This power has been exercised in several instances in the past, and one of our new hospital buildings will be made into a strong ward for the detention of these cases. Its disciplinary effect on those already inmates of tuberculosis hospitals should be far reaching and be a material aid in governing such institutions. It is reasonable to believe that the forcible removal of an unruly patient will have a soothing influence on others similarly inclined.

The various methods that may be employed by the Health Officer in the campaign against tuberculosis are legion. They will suggest themselves as the indications vary in individual cases.

As a general rule, they should be so directed as to prevent the development of the disease. Active cases have to be cared for, but were it possible to devote all the time, money, and effort to prevention that are now devoted to the care and cure of active cases, the end of tuberculosis as a world scourge would be in sight.

THE RELATION OF THE PHYSICIAN TO THE ANTI-TUBERCULOSIS CAMPAIGN

By James Alexander Miller, M.D.
New York

Introduction

The entire practice of medicine at the present time is in a stage of transition. Here, as elsewhere in our modern life, it is a period of change and unrest.

The solemn pronunciations of the physician couched in unintelligible language have in the past been accepted as the will of fate, subject neither to change nor to criticism. This is true no longer and it is better so; but with the change the medical profession has lost a certain hold upon the community which was founded, perhaps more than was realized, upon a blind faith combined with a certain awe of a mysterious unknown.

Now, however, an enlightened laity knows that medicine is not always an exact science and that human ignorance and human failings are quite as general among physicians as they are among other men.

And, moreover, the restless search for fundamental truths has shown that the practice of medicine is really no mystery at all, but rather a rational system based upon simple facts, the application of which is not beyond the understanding of any intelligent and educated person.

Physicians themselves are primarily responsible for this change; for modern scientific medicine has discarded many cherished theories and has developed a new practice of medicine which consists largely in efforts for prevention of disease together with a much more restricted system of therapeutics, founded as far as possible upon a solid basis of scientific fact. Where scientific knowledge is wanting, modern therapeutics consist largely of an alliance with Nature herself, assisted by a rational appreciation of the simple truths of physiology and hygiene.

We are at present in a period of readjustment to these new points of view in modern medicine. Out of the confusion is already emerging the

physician, no longer the high-priest of mystery, but rather the guide and interpreter of certain natural phenomena of vital interest and importance to every individual. In this way the physician works with the patient, not by dictation, but through mutual co-operation and understanding. In simple language he defines the extent as well as the limit of modern knowledge and extends his influence as far as he may be able in his community, not only for the cure, but more especially for the betterment of hygiene and the prevention of disease.

Such, at least in its tendencies, is the modern practice of medicine, and with it must come, in some form or another, its expression in the wider sphere of what is somewhat opprobriously termed State Medicine. The health of each individual can no longer be considered simply a matter of personal concern, but quite as much one of public interest and responsibility.

This situation, whether we like it or not, we physicians must face, and if we are wise we will mold and direct these tendencies into sound and rational channels, rather than waste our efforts and discredit our profession by fruitless combat with the inevitable.

To some of us this change opens wide the door of opportunity for nobler and more efficient service, and in no branch of medicine is this so evident as in the anti-tuberculosis movement.

Our consideration of the relation of the physician to this movement may be covered separately in the six main phases of medical activity: Private Practice, Hospital and Dispensary Practice, Research Work, Public Health Service, Activities Connected with Civic and Philanthropic Organizations, and, last of all, as Citizens of the Commonwealth.

In Private Practice

The most crying need is for better medical training. Incipient tuberculosis as a clinical entity has been generally recognized only in recent years and is still largely neglected in medical teaching. In consequence, older practitioners are largely ignorant of the principles underlying the early diagnosis of this disease. This has resulted in wide-spread criticism from an aroused and enlightened public, and this in turn has fostered a lack of co-operation or even antagonism to the anti-tuberculosis movement on the part of many general practitioners.

This is most unfortunate, especially when we realize that to this body of men we must in the main look for the application of modern principles of diagnosis and treatment. The pendulum of denunciation of general practitioners, though perhaps deserved in large measure, has swung too

far, and the integrity as well as the ability of individual physicians has been falsely impeached for failures which are often due to lack of opportunity either in education or in experience, or both. The rise of a better equipped generation of younger practitioners must be recognized and greeted with deep satisfaction and warm welcome. The fetish that early diagnosis is a mysterious art possible of attainment only by the chosen few, should be discarded and these younger men afforded the opportunity to take their legitimate place in the anti-tuberculosis campaign, thus giving them the chance to prove their worth, and gradually to lift the suspicion of inefficiency from the profession as a whole.

For the older practitioners, and those less favored by education and experience, some concerted plan should be devised to supply their deficiencies. No better way appears to offer than that already instituted in some localities, by which physicians in charge of public sanatoria take pains to keep in touch with the local physicians in the communities from which their cases come. This may be done by periodical reports and helpful criticisms upon cases sent to the sanatoria, or by frequent addresses to local medical societies, or, most valuable of all, by holding frequent clinics upon tuberculosis in the various communities, at which clinics the various phases of the diagnosis and treatment of tuberculosis may be emphasized.

In addition to this there are certain tendencies in general practice which appear to need correction in order that the best results may be obtained.

The common failing by which interest is concentrated upon cases of acute or severe illness to the neglect of minor or less urgent ailments surely leads to many cases of undetected tuberculosis. A failure to recognize the ubiquity of tuberculosis, combined with a too intimate and personal point of view, often diverts the family physician from the attitude of eternal suspicion, which is the only safe position in regard to tuberculosis and which is often the secret of the success of the specialist. Early diagnosis by family practitioners demands a faculty of personal detachment which is not always easy.

The time is surely coming, as we already see it in some industrial establishments, when periodical examinations of all individuals, whether suspected of disease or not, will be made, and if this could only be the rule in general practice, especially when it is known that the individual has been intimately exposed to tuberculosis, it would be a great factor in the early recognition of many cases which are now overlooked.

Then, too, overwork, the common lot of the general practitioner, leads

in many instances to careless methods, especially in the matter of physical examination.

The pressure of modern life and the struggle for existence are felt nowhere more keenly than in the practice of medicine. Income depends upon the number of patients, and here, as elsewhere, unregulated quantity usually detracts from the quality of the service rendered.

Speeding and overpressure are national faults and the remedy is not apparent, but it would seem as though the beginning of the struggle against these influences should be found among professional men.

In Hospital and Dispensary Practice

The general principles here are, of course, the same as in private practice, and the same needs and responsibilities are evident, only perhaps intensified.

Special tuberculosis clinics have done as much as any other one agency toward raising the standard of medical work in tuberculosis, and they constitute the pivot of the campaign in every large community.

It is in hospitals and dispensaries that medical and social forces join hands in closest harmony, and here as in many other directions tuberculosis has led the way.

Hospital social service represents the realization of this contact and is already lending its broadening influence to all phases of institutional activity.

The physician should be the center and guide in this work, and, in consequence, must develop that quickening social sense which looks behind the mask of evident disease to discover the multitude of social ills, of which disease is so often merely one expression.

Too frequently physicians have failed to realize this responsibility, and already we hear mutterings of discontent from social workers complaining that physicians are not interested or qualified to guide their work and, consequently, they are calling for freedom from medical restraint.

As a matter of fact, it would seem as though physicians must plan the campaign in all social work where disease is the central point of attack, but in order to do this they must understand and correlate the various points of view which are brought to bear by the social workers who for this purpose may be considered their great aides.

Hospital social service, to be sure, *may* be rendered without the physician, but it will fail of its highest efficiency and may even miss the mark entirely.

Just a word of the relations of sanatorium physicians in this connection. They occupy a special field and have special opportunities, not only in their

immediate duties, but particularly for the training and education of their patients who are to go back as missionaries of health to the communities from which they come.

In large measure these physicians are responding splendidly to their opportunities. Could they not, however, keep in closer contact with the local conditions in these communities, learn to realize better the complexities of the environment so different from the simple sanatorium régime? In so doing, perhaps, they would spare advice which is impossible of accomplishment, and possibly use greater individualization in the consideration of their patients by attempting to harmonize abstract ideals with the stern realizations of actual life.

For, after all, the problems of after-care should be as important to the sanatorium physician as they are compelling to the family doctor at home.

Here, too, should be again emphasized the possibility of mutual helpfulness already discussed by the plan for local clinics to be held by sanatorium physicians. They would in this way no doubt gain quite as much useful knowledge as they would be able to impart. For sometimes one is forced to think that sanatorium physicians are quite as ignorant of the demands of real life at home as the family practitioners are supposed to be of early diagnosis.

In Scientific Research

We are apt, in the stress of social and clinical problems, to overlook our absolute dependence upon scientific medicine for reliable methods of approach.

The discovery of the tubercle bacillus by Robert Koch paved the way for the whole modern campaign against tuberculosis, and ever since then careful investigation and experiment have continued to guide us in our efforts to control or cure this disease. While hopes for a specific cure have been thus far disappointing, success with other infectious diseases sustains the belief that some day such a cure will be forthcoming, but it can only come through laboratory research.

It is peculiarly important that the public realize this dependence upon scientific investigation in our popular movements against preventable disease. Intelligent knowledge in this respect will be the best safeguard against unreasonable efforts to hamper animal experimentation—efforts which are founded upon false premises and sustained by an appeal to a one-sided and unreasoning sentimentality.

Another important advantage gained by close touch with the laboratory

is a better appreciation on the part of both physicians and laity of the inherent falsity of the claims for the numerous so-called cures which are so often successfully exploited. These frauds constitute one of the saddest commentaries upon our modern civilization, and possibly one reason why our anti-tuberculosis campaign thus far seems to have made so little headway against them may be found in our failure systematically to inculcate sound ideas concerning the fundamental necessity for a scientific basis for our theories as well as for our practice.

In Public Health Service

This phase of the physician's responsibilities has already been admirably discussed in the preceding address and need not be further considered.

It may be desirable, however, simply to emphasize that in the future development of the tendencies in modern medicine which we have considered, the physician trained in sanitary science and in public hygiene must be the acknowledged leader.

For such men the future will undoubtedly find great need in the public health service. At present the facilities for training physicians for this service are woefully inadequate and the incentives to accept such positions lamentably small.

A far-seeing policy on the part of institutions for medical instruction will supply the former defect, but much more generous inducements must be offered by State or municipality in order to attract the type of men needed for this responsible work.

In Connection with Civic and Philanthropic Organizations

These organizations constitute the backbone of the campaign for social betterment all over the world. Foremost, perhaps, among such activities are the various movements aimed at the eradication of preventable disease, and here, of course, tuberculosis has held a chief place.

The very best elements of our civilization are here represented, and the success thus far attained bears witness to their ability, resources, and enthusiasm.

The relationship of physicians to these organizations has varied somewhat in different communities. In some, physicians have furnished the original inspiration and have continued to dominate the whole situation. In others, the laity have outrun their medical associates, becoming impatient of their conservatism or lack of enthusiasm. Still others have been able

successfully to combine the lay and medical interests upon a harmonious and effective working basis, and this represents the ideal plan of organization.

In such company the physician, to be truly valuable, must have learned much of the modern standards of social and charitable work in order to co-ordinate the strictly medical problems and properly to appreciate the point of view of the social experts with whom he is associated.

No experience is more productive of future helpfulness to the physician than that which may be gained by membership in local agencies for the relief of the poor and the study of their social and economic environment. Opportunities for such experience are not lacking in any community, but unfortunately few physicians avail themselves of them.

While they need not expect to become expert sociologists, the acquirement of the "social sense" is so valuable an asset to physicians in their work that they can ill afford to neglect such opportunities. Special medical knowledge becomes in this way doubly valuable, because it can be adapted to actual social conditions of which, in the past, medical men have been remarkably ignorant and neglectful. Upon the other hand, in this way the position of a physician as an expert adviser in medico-social problems becomes greatly strengthened and secured.

As Citizens

Physicians are notoriously poor citizens. The nature of their professional work, which is necessarily engrossing, may be advanced as a sufficient reason for this. It is evident, however, that with a proper realization of the responsibilities of the newer practice of medicine to which we have referred, such an explanation must be recognized as failing to offer a reasonable excuse.

Students, scientists, and clinicians we must continue to be, but the call of the future is for a wider application of our special knowledge expressed in public efforts on behalf of the common good.

In the past, our profession had commanded the devotion, enthusiasm, and self-sacrifice of its members, but its viewpoint has been more or less self-centered.

The achievements of preventive medicine have revolutionized our practice, to be sure, but, better still, it has thrown open the gate of opportunity and responsibility for active participation in all the social and economic problems which are pressing for solution all over the world. Our medical horizon has thus become immeasurably widened.

The dimmest appreciation of the changed relationship, such as we have

endeavored to trace between the physician and their private or hospital practice, their scientific investigation or their public and civic activities, cannot fail but indicate the splendid opportunities for efficient citizenship which today lie open before the medical profession.

We physicians love our country as much as other men. We are proud of our democratic institutions. We share in the growth and development of this wonderful land of ours. But we have been very busy with our own most interesting and engrossing business.

The memorable traditions of our profession guarantee, however, that it will not fail to grasp these developing opportunities to serve the Commonwealth. In the solution of the inevitable problems of transition which are involved we may look for the campaign against tuberculosis to take the lead in the future as it has in the past.

Thus may we hope to fulfil our full responsibilities both as physicians and as citizens.

THE RELATION OF THE LAYMAN TO THE ANTI-TUBERCULOSIS CAMPAIGN

By J. L. Ludlow, C.E.
Winston-Salem, N. C.

To the physician tuberculosis is a disease most insidious in character and most baffling to curative medical practice and skill. To the public health officer it is a burden of alarming proportions in his work of conserving and promoting public health conditions. To the layman it is a problem of economics and conservation, of altruism and self-preservation. To all the people it is a social problem involving the happiness and hopes of mankind.

It is essentially a social and an economic problem in which the entire citizenship—the State and the nation—is involved. Being a problem of society and of the State, the burden of its solution should not be imposed upon any single profession or group of citizens. Indeed, its solution cannot be reached by either physician or public health official, nor even approached by them, except in co-operation with that class or group of society which, by reason of superior mental endowment and a highly developed civic consciousness, constitute the leaders of the public in molding and directing human thought and action.

In community life it is a social burden of vastly comprehensive proportions. It involves practically every other phase of civic life usually classed as social problems—even immorality and vice cannot be excepted.

The causes of tuberculosis, and its prevention, embrace the problems of child-labor regulations, school facilities, housing conditions, low wages, long hours, cost of living, factory conditions, private and public sanitation. As each of these pertain to personal and public health and to the impairment of physical strength and vigor, so do they measure the effective infection, and the prevalence of tuberculosis in community life.

The degree of prevalence of this disease in a community or city does not measure the standard of medical practice. But it is a correct and infallible index of the private and public hygienic habits and conditions of that com-

munity. It is the disease-barometer of wrong living and defective sanitary environment. Only to a small degree may we hope for its solution by the physician or by the most aggressive public health officer without the active co-operation and support of other municipal officials and by the public as well.

As in all great battles of history, where the destiny of States and of nations is at stake, there is glory enough for all, so it may be said in reference to the warfare against this dread disease: there is *work* enough for all—physician, health officer, and layman. How their respective talents and efforts may be co-ordinated to accomplish the most effective results must, therefore, be an interesting question, and one of considerable importance.

The physicians have a most effective field in pursuing the study of curative means, and, through the confidence which their professional relation inspires in the public mind, can, when so disposed, do more to encourage hygienic living habits and conditions than any other group of citizens.

The public health officer can do much or little in promoting the standard of general health and of sanitation in his community with a corresponding success in improving tuberculous conditions, according to whether or not he is more a teacher and an administrative officer than a medical practitioner.

But, like typhoid fever and certain other infectious diseases, tuberculosis is not a problem for the physician and health officer alone, and in its prevention and control their success will be determined by the degree of active assistance and co-operation of the layman.

Prevention, rather than cure, must appeal to all reasonable minds as the rational solution of any evil. Hence the tuberculosis problem becomes largely a matter of teaching, of precept and example, of earnest effective agitation, until the conditions that are responsible for the deplorable prevalence of this disease have become common knowledge, and the proper conception of human life in health versus simple physical existence has become more universal. The physician will continue the pursuit of further curative agencies of tuberculosis as of other diseases, but knowledge and practice to prevent must be the first consideration rather than hospitals, charity, or even medical treatment to cure.

To analyze briefly civic obligations and responsibilities, I would repeat that tuberculosis is at once a medical, a social, and an economic problem. The enormous figures which measure the national waste by reason of preventable disease, including tuberculosis, are so familiar to public health literature as to justify their omission here, except to quote some apparently conservative figures presented to this Association at its Seventh Annual

Meeting, one year ago, in regard to tuberculosis. It was estimated by Mr. McSweeney that the annual loss to the United States from this disease amounts to more than $600,000,000; and, furthermore, that "the final cost to the nation for those now living who will die from tuberculosis (assuming present conditions to continue) will be $22,402,000,000—a sum approximately four-fifths of the combined debts of all the nations of the world."

No further figures are necessary to demonstrate its magnitude as an economic problem. But can we hope for more than a small number of our citizens to have any real conception of these figures or attach serious significance to them? Can we hope that they will inspire any substantial personal effort in behalf of public health?

In our form of government an economic question at once becomes a political question in which all voters have a voice. When questions that are measured in terms of the dollar-mark are presented to the people there must be a personal application to insure a hearing. Can the loss by death of a member of your family or mine be measured in dollars? Neither can it be to the most humble citizen. And even less can the death of members of other and unknown families impress the public at large as an economic loss.

It is contrary to the normal workings of the mind to measure human life in dollars and cents. Indeed, it has no such value even to the State except in an abstract way. Domestic animals die from disease; crops, trees, and fruits are ruined by blight, and the financial loss is apparent to every citizen, whether it be his own or his neighbors' property, but not so with human life or health or happiness.

It is alike my fear and my belief that the economic aspect of tuberculosis will never inspire or accomplish the solution of the problem, except as it may be used to accentuate or to supplement the altruistic spirit of mankind and the vision of social service. In other words, it is my belief that the disease can be eradicated, or its abnormal prevalence substantially checked, only as it is stressed and accepted as a social problem, involving alike a field for altruistic social service, self-preservation, and home safety.

As a purely medical problem its solution can be only a matter of hope that continued research may be rewarded by the discovery of some potent curative agency. But even so, the social evils of which the disease is but an index would still be with us, and only cures and not prevention would result. Hence, at best, there would be but a poor and partial solution of the problem.

If, then, the disease resolves itself into a social problem in which all

society has a duty to perform and may have a part in its solution, upon whom logically rests the responsibility—or, preferably, I would say the privilege—of leadership in the campaign against its abnormal prevalence?

In this connection it is pertinent to observe that every citizen, in whatever walk of life, owes some duty to society according to his training and ability to serve. And it must be taken as axiomatic that each citizen can best give his contribution to public service along the lines of his own profession or occupation.

The development of legislation to protect and conserve human rights and the rights of property can be most ably done by lawyers whose minds, by practice, are trained along these lines. Banking and currency reforms to meet the industrial and commercial development of the country may properly be expected from the bankers with their training and opportunities to learn the intricacies of the problem. The economic solution of problems pertaining to community water supply and sewage disposal, street construction, and other physical municipal equipment may rightly and logically be expected from the research, study, and practice of engineers.

And so on through all the phases of social service there is some particular group of citizens best qualified to serve because of training for similar undertaking in their own private pursuits.

Therefore, does it not at once appear that the privilege and the burden of responsible leadership in the great social problem involved in tuberculosis rightly belong to the medical profession, and that society has a right to expect from the ranks of that profession active and potential leadership in this campaign? How society may, in turn, give loyal active support and assistance to such leadership will be treated in what follows.

As the prevalence of tuberculosis is the index of the living, housing, and working conditions in a community, so the improvement of these conditions will measure the decline of the disease. Then it becomes manifest that it is a problem the solution of which must appeal to the co-operation of the sociologist, the economist, the professional man, the manufacturer, the merchant, and the tenement-house owner, and, above all, the teacher and preacher of the gospel of sanitation and health, whether he be physician or preacher, lawyer or merchant, according to his altruistic impulse and his conception of the duty of citizenship.

It is only through a proper conception of civic duty on the part of such leaders in thought and action in community life that public sentiment can be aroused, and the proper conception of personal and official responsibility for the prevalence of this disease can be established.

As I understand the anti-tuberculosis campaign, there are two lines of successful defense. One of these is to intercept and shorten the range of the bullets of the enemy—the tuberculosis germs. The other is to equip the defensive forces—*MAN*—with armor which is proof against successful attack. The first line of defense is largely in the hands of the physician and health officer, who, by directing and compelling (if need be) the exercise of proper precautions on the part of patients, can avoid or prevent the spread of their infection. But in that work which is most effective, even in this line of defense, viz., the segregation of the more advanced and most infectious cases, and the maintenance of adequate public health departments, free dispensaries, and visiting nurse work, the physician and health officer are helpless without the co-operation and support of the public, or at least the leaders among the laity.

It is in the second line of defense, viz., vital resistance, that upon the laity must be placed the main dependence. Except as the physician and the health officer perform the functions of leaders and teachers, they are on equal footing with the layman in this phase of the campaign.

The physical equipment successfully to resist the invasion of the tuberculosis germ is both an individual and a community problem. It is principally individual in effort, but dependent upon community conditions for successful results. It is a matter of individual knowledge and of community practice, and as these become more universal so will the results be measured. The community must be taught that the essential prophylaxis against tuberculosis is to dwell and labor in cleanly surroundings with an abundance of fresh air in living, working, and sleeping quarters, supplemented by a simple wholesome nutritious diet. This is not a difficult rule of life. So simple indeed is it that failure to follow it may well excite our wonder and curiosity. Through ignorance and indifference alone can it be explained. The masses of the people are still ignorant that the disease is not inherited; ignorant that it is relatively curable; ignorant of, or lacking in regard for, the essential elements that must surround human life for the development and maintenance of physical health and vigor. Then what is the remedy to be applied? Agitation and education—education in the elementary principles and facts pertaining to tuberculosis and the methods of its infection; education in the fundamental requirements of sanitary environment, both within and without the home; education pertaining to the sanitation of school buildings and public places, and in regard to the conditions that should be provided where people are congregated in their various and sundry employ-

ments; education to promote more general knowledge relating to hygienic habits and conditions of life.

It is in this conception or phase of the problem that the layman's opportunity is found and his most effective duty defined. Here the physician and the health officer, fighting alone, must fail. Here it is that the preacher, the teacher, the man of superior attainments, the good citizen, must move up to the firing line and do his part in bringing about a general improvement in all that pertains to municipal sanitation, and, indeed, much that pertains to the general sociological conditions of community life. This involves a new conception and practice in regard to living and housing conditions of the poor and the laboring classes; a new conception of duty of the employer to the employee, of landlord to tenant; a new understanding of the elementary principles pertaining to healthful life in home, school, factory, and workshop; a new vision of the beauty attaching to cleanliness of public buildings, streets, factories, stores, homes, and of the person; a greater appreciation of the need of judicious, wholesome, simple food to promote personal health; a more perfect realization of individual responsibility for his own as well as for the public health; a lessened apathy concerning the prevalence of disease and a greater public interest in all things that tend to its decrease; a higher conception of civic duty in regard to the broad social relations of community life; and a more general knowledge of the fundamental laws of nature pertaining to human life and health, and that these laws are as immutable, as unchangeable, as certain, and as unrelenting in their operations as any other of the more evident laws in the creation, development, and ultimate destiny of the universe. In promoting these conditions the layman will find a field of abundant service, and with these precepts written in the conscious or unconscious code of individual and community life, an environment will be automatically created such that the attack not only of the germs of tuberculosis but of the germs of kindred diseases will find the human fortress impregnable by reason of a high degree of natural or acquired immunity. Safety in personal and community life will thereby be greatly conserved and the conditions which favor the spread of tubercular infection will be minimized.

When among the laymen there shall have been developed this conception of civic duty in the anti-tuberculosis campaign, then will they become actively interested in the quality and character of the public water supply, and in the disposal of sewage, garbage, and other waste products: in the clean back yards; in the care of streets and other public places, and in the problem of dust and dirt prevention; in the provision of parks and

public playgrounds for outdoor recreation; in the proper housing and feeding of the poor; in the prompt reporting of all infectious and contagious diseases by practising physicians; in the proper observance and enforcement of isolation and quarantine of infectious and contagious diseases, and of disinfection and proper disposal of germ-laden excretions; in a properly organized and faithfully executed plan of registering vital statistics; in the proper inspection of the meat and milk supply and other food-products; in the proper teaching of personal and community hygiene in the public schools and Sunday-schools, and its advocacy by the pulpit, the press, and in State and city offices. With an active interest in such factors of community life on the part of the public, then will there be a reasonable hope for the universal application of the sanitary gospel that in the warfare waged by the microscopic foes of human life against the health and happiness of mankind, unremitting vigilance and intelligently directed combat are the price of safety.

And thus, in upholding the hands of the physician and health officer, and in molding and shaping public opinion and practice in matters pertaining to public health, will the layman find his place in the ranks of the anti-tuberculosis campaign. Whether this place shall be one of leadership or follower will depend upon the service rendered and the motive in which it is conceived. But whether leader or follower will be of little moment to those whose consecration to the cause is such as to make them potent factors. Co-operation will be the keyword that shall lead to success.

DISCUSSION ON PAPERS BY DR. PROBST, DR. LANDIS, DR. MILLER, AND COLONEL LUDLOW

Dr. Vincent Y. Bowditch, Boston: Mr. Chairman and members of The National Association for the Study and Prevention of Tuberculosis: In the necessarily short time for discussion upon so varied a subject I must confine myself to a few points about the relation of the physician to the study and prevention of tuberculosis as presented by Dr. Miller.

As he has truly said, there is a crying need for more thorough instruction among our medical students and the profession at large as to the vital importance of recognizing the earlier symptoms of this insidious disease. I trust that it will be understood that when I deplore the often haphazard methods still employed by many physicians when a patient presents himself with suspected pulmonary disease I am not resorting to carping criticism of the general practitioner, who, for general intelligence and ability to deal with a great many diseases, often can take precedence of the specialist.

I yield to none in my respect for men of this type; and it is only with a desire to help and not to blame, when I say that it is frequently brought to my notice that precious time has been lost for the patient by the lack of sufficient caution on the part of the physician in attendance.

Blame cannot be laid at the door of any one who, after careful examination, failed, from lack of experience, to make an accurate diagnosis. Surely it is reprehensible, however, that lack of time or knowledge can be given as an excuse for improper examination if opportunity offers, and as it usually does, to depend upon expert advice in case of doubt. In acute surgical cases the services of a specialist are usually called upon when doubt exists. Why, then, deny to the tuberculous patient an equal privilege if he be showing symptoms of a malady equally fatal, it may be, in its consequences, and in which a prompt and early diagnosis is essential to his welfare? I have often been shocked by the knowledge that months of valuable time have been lost by the careless diagnosis and advice of some physician who has failed to make a correct diagnosis, and who has declined to consult the specialist until symptoms have given such alarm that further advice has been demanded.

Happily, this ultraconservative and wrong attitude is lessening in the profession, I now believe, and in contrast I notice much more frequently a tendency on the part of the general practitioner to watch more closely and to seek special advice early in the patient's history where there is doubt. In this connection it is gratifying to notice, what is frequently the case in the experience of those who are connected with sanatoria, namely, that the laity is much more alive to the importance of early diagnosis than it was even a decade ago. It is the experience in sanatoria that a large number, if not the majority, of applicants for admission are those whose friends have been former patients, who have been taught the necessity of early diagnosis, and who preach the gospel in the communities in which they live—a gratifying instance of the educational effect of sanatoria, with consequent benefit to the cause of preventive medicine. Thus we see the importance of what Dr. Miller so strongly points out, namely, the need of cordial coöperation between the profession and the laity in the study of methods for lessening the ravages of tuberculosis.

Another point I wish to dwell upon in this discussion—and it is one that I broach whenever opportunity is given me: There has been a tendency in the past few years to decry the good effect of sanatorium treatment and to claim that, because it has not accomplished everything, or perhaps not all that ill-advised zealots claimed first, it was, therefore, a failure. Such a

position is as absurd as that of the overhopeful advocates who claimed too much and thereby did harm to the cause. Those who knew most about the subject recognized from the outset that there were certain definite limitations to this method of treatment, even while they brought forward the infinite amount of good that could be accomplished by it not only to the individual most concerned, but by its educational value to the community at large.

Not until the narrow view that a certain method should be disregarded because it has not accomplished everything, shall be replaced by a broader outlook upon the question, and not until we recognize that sanatorium treatment is but one factor among many others of great importance, shall we make the progress we are striving for in the fight against this disease.

It is doubtless a regretable fact, and one that needs much attention, that many cases relapse upon a return to ordinary conditions of life after a successful sojourn in sanatoria. This fact, however, does not reflect upon sanatorium treatment, which showed what can be done to bring patients back to health; but it teaches us that we must endeavor to correct, as far as lies in our power, the conditions after leaving the sanatorium which tend to undo all the good already accomplished. At the same time we must not forget, as we are apt to do, the large number—well known to any one who has had experience in sanatoria—who have kept their health for years after a return to ordinary conditions of life. I speak as one who has had intimate association with the Sharon and Rutland sanatoria in an experience of over twenty years, and as one who fully realizes the great good that can be accomplished, even while fully alive to the limitations that exist in every known method of treatment of tuberculosis.

Dr. Miller has wisely suggested the importance of recognizing the fact that it is practically impossible for many of the patients discharged from sanatoria to carry out the methods employed while there and under supervision. This only emphasizes the importance of coöperation among all physicians who view these varying conditions from all aspects. Much can be done to help these patients, even if it be but to see that moderate and comparatively inexpensive methods of ventilation are employed, both in their homes and in the places where they work. Naturally, the laity must take its large share in intelligent coöperation in bringing about these results.

Meetings among men in the same community who are engaged in this work I regard as a most valuable means of bringing out important facts which bear upon the welfare of all. In Rutland, Massachusetts, the local so-called "Private Sanatorium Association" has its periodical meetings, at which various questions touching not only upon the work in the private

sanatoria there, but also upon matters relating to conditions in the town, are brought up. The relation between the permanent and transient residents, and, in fact, all matters of public interest regarding tuberculosis, are discussed. This is a worthy example for other communities to follow, for its influence is far-reaching and one of the best means of bringing an intelligent, broad-minded attitude toward the whole subject, not only to the medical profession, but to the laymen living in communities in which sanatoria exist.

In Rutland it is a very noticeable fact that the attitude of the permanent residents has markedly changed from one of almost hostility to that of friendly helpfulness. Not only have houses been opened to receive patients as boarders, but, by the influence of the physicians, the character of the boarding-houses themselves has greatly changed for the better, the proprietors showing a greater willingness than in former years to follow the strict hygienic methods adopted and taught by the physicians.

Hon. Edwin F. Sweet, Grand Rapids, Mich.: I think, Mr. Chairman, when you asked me to enter into the discussion on this subject you made a great mistake, because I am not a physician, and I do not realize that I have had any experience which would give me a right to talk in a meeting of this kind, although I have listened to the papers read this evening and to the discussions this afternoon with a good deal of interest.

I have heard a great deal said about the city government entering into this fight against tuberculosis. I have had some experience as the Mayor of Grand Rapids, and in some other capacities which will perhaps enable me to talk on this subject a little from that standpoint. Years ago we organized in the city of Grand Rapids an anti-tuberculosis society. It was the first of the kind, I have been told, that was organized in the State of Michigan. Grand Rapids, as perhaps many of you know, is a city of about 120,000 population, and may be taken as a fair type of a moderate sized city of the United States. It is composed of a laboring population engaged largely in the furniture manufacturing industry. Many of our people are skilled laborers, owning their own homes, and are perhaps a little above the average in cleanliness and in sanitary conditions. One of the obstacles we ran up against very early in our anti-tuberculosis work was a want of funds. Every little while we needed more money, and we did not know where to get it. We resorted to various schemes. Among other things I recall we hired a man to spend two or three weeks in securing money from different people, and paid him a liberal commission on account of the

subscriptions he obtained; but we were always poor, and I dare say this is so with every other organization of this kind.

After I was elected to the office of Mayor of Grand Rapids my attention was called to the fact that many of our citizens were not getting value received for the money expended, and chiefly I noticed this in the collection of garbage and in the sprinkling of the city streets. Here would be a man, as the system was then, who would pay for the collection of garbage while his neighbor would not. The neighbor would scatter it in the back yard, and the one who paid would suffer as much as the one who did not. It was the same with the sprinkling of streets: one property-owner would sprinkle to the middle of the street, while the man on the other side would not sprinkle at all, and the consequence was the dust would be as offensive and injurious to the man who sprinkled as to the one who did not. It seemed to me that these were municipal problems: that the man who did his duty was not getting a square deal; that money raised by taxation ought to be used for these purposes, and the whole community get the benefit of it. We adopted that plan. We got sprinkling carts and made a contract with the street railroad company which procured big tank sprinklers, and all these were used to allay the germ-laden dust. We abolished the contract system of collecting garbage and made it a municipal proposition and paid for it by taxation.

When the matter of raising money for stamping out tuberculosis came into my mind, and I had some authority back of me, I took the position that inasmuch as we raised money by taxation from all the people for sanitary purposes and for our city hospital, we should try to protect tuberculous patients and should spend a little money in that direction. I made up my mind that it was right for us to go ahead and raise money by taxation and pay for doing this noble work, and we did. The hospital I spoke of was located near a cemetery; it was called the "Pest House." I procured 31 acres of land better located for hospital purposes. We bought a large tract so as to locate tuberculosis shacks in a remote part of it, and they are doing an immense amount of good.

What I want to emphasize is this: there is no logical reason on earth why money cannot be raised by taxation in ample amount for this purpose, rather than depend upon the contingencies of benevolence. We know that when people are stirred up they will give freely, but we know that is spasmodic. It dies out. Now, there is in this audience, I think, a gentleman from Grand Rapids who went with me and some others to Lansing, the capital of our State, for the purpose of getting legislation to appropriate

money for a State institution for the treatment of tuberculosis. When we got off the train the Governor of the State was at the railroad station to take the train for Detroit. We had two or three minutes' talk with him, and told him what we wanted. He said, "You will not get any money from this legislature because it has appropriated every dollar it can afford to appropriate." I said to him, "Governor, if we get the legislature to give us a liberal appropriation, well you veto it?" He replied, "Oh, no." Well, we got $50,000, and a tuberculosis sanatorium has been put up with that money. We have had some other appropriations, and we are doing a lot of good. The point I want to make is this: whether we are physicians, or laymen, or health officers, or whatever our position may be, we have a duty to perform to ourselves, a duty to our families, a duty to the community in which we live, and if any of us should happen to be elected to a position that will give us more authority, for God's sake let us use that authority right and do something that will benefit mankind and the community in which we live.

Perhaps I have said enough. Your chairman made reference to taking off his hat to laymen who were great workers. I do not exactly agree with him. The great part of this work rests on the physicians who have made discoveries which have enabled us to go before the community and tell people how they ought to live and what they ought to avoid; that this is not an inherited disease, but is one that can be eradicated from the civilized world.

I am enough of an optimist to believe that we are going to succeed. It is not a question of whether we will blot out this disease: it is a question *when* we will. That is all there is to it. We are going to do it some day, and it rests with all of us—health officers, physicians, and laymen—to do it as speedily as possible.

SOCIOLOGICAL SECTION

Chairman

FREDERICK L. HOFFMAN, LL.D.

Newark, N. J.

Secretary

FRANK H. MANN

New York

A BRIEF ACCOUNT OF THE TREATMENT AND CARE OF TUBERCULOUS WAGE-EARNERS IN GERMANY

By Frederick L. Hoffman, LL.D.
Newark, N. J.

The treatment and care of tuberculous wage-earners in the German Empire has been a question of serious government concern for many years. Since practically the entire wage-earning population is subject to the compulsory invalidity insurance laws, the prevention of invalidity, or disability resulting from disease, is obviously of the utmost economic importance. Under the law of 1899 the invalidity insurance institutions are authorized to undertake the treatment and care of invalid members, provided that there is a reasonable assurance that the patient's wage-earning capacity will be restored and preserved for a reasonable period of time. Realizing the inadequacy of existing institutions or methods and means for the treatment of invalid members, particularly of those suffering from tuberculosis of the lungs, the insurance institutions established public sanatoria at their own expense, or furnished funds at reasonable rates of interest for the establishment of such institutions by municipalities or larger administrative communities. On account of the fact that tuberculosis of the lungs is one of the chief causes of physical impairment, with resulting loss of earning power, the activity of these insurance institutions in the field of preventive effort and cure has been largely centralized upon this most important disease. The treatment and care are without expense to the patient, who is, however, required to have made not less than two hundred weekly contributions to the invalidity insurance fund. In addition to the patient's care, financial support is provided for the patient's family so as to relieve personal anxiety and bring about the best possible conditions for a cure.

The extent to which institutional treatment of tuberculous wage-earners has been developed in the German Empire is made evident by the statement that there are now 99 public sanatoria and 34 private sanatoria in the German Empire, with a bed accommodation of 14,186. With an average

duration of treatment of three months, it is estimated that 56,700 tuberculous patients can be taken care of, and the very large majority of these would belong to the wage-earning class. Of the 99 public sanatoria, 38 are owned and maintained by invalidity insurance institutions. In addition thereto, more or less adequate provision is made for tuberculous children in 22 institutions, and for children liable to tuberculosis, scrofula, anemia, etc., there are 86 additional institutions, aside from 7 school sanatoria and 98 forest day and night camps. There are also several agricultural colonies for tuberculous patients discharged from public sanatoria as successfully treated, quite a large number of observation stations, and 528 tuberculosis dispensaries and information bureaus, exclusive of 537 dispensaries of this kind in the grand duchy of Baden.

The activity of these institutions is intelligently co-ordinated and sustained by a nation-wide associated movement for the prevention, study, and care of tuberculosis of the lungs. During the period 1897–1909, the number of tuberculous patients treated and cared for at the expense of invalidity insurance institutions was 275,207. During 1910 the number of tuberculous wage-earners treated and cared for was 46,717. On the basis of an estimated insured population of 14,631,000, the institutional admission rate on account of tuberculosis of the lungs was 3.19 per 1000. The expenditures incurred on account of the 46,717 patients during 1910 amounted to M. 17,472,000 ($4,158,336), or M. 374 ($89.01) for each case.

Considering only the 45,609 patients who received full institutional treatment, it is stated in the last annual report of the Imperial Insurance Office that 3077 of these, or 6.7 per cent., discontinued the treatment before the same was completed. The number of days of required treatment on account of tuberculosis of the lungs in behalf of 42,532 patients was 3,268,266, or an average duration of treatment of 76.84 days. Deducting the expenses incurred on account of patients discharged before the treatment had been completed, the average expenditure per patient per case was M. 399.70 ($95.13), or M. 5.22 ($1.24) per patient per day. Of the expenditures incurred, M. 2,519,660 ($599,679) was on account of the financial support of the patient's family, for the purpose of relieving him or her from undue anxiety concerning the economic condition of the family at home.

The number of male patients treated and cared for on account of tuberculosis of the lungs during 1910 was 31,508, and the number of female patients was 15,209. On the basis of an insured male population of 10,023,000, the admission rate was 3.14 per 1000 for males, and on the basis of an insured

population of 4,607,000 females, the admission rate for 15,209 female patients was 3.3 per 1000. The average expenditure per male patient during 1910 was M. 394.30 ($93.84), and on account of female patients, M. 332 ($79.02). The number of males successfully treated, from an economic point of view, that is, with the expectation of restored wage-earning capacity for a reasonable period of time, was 24,666 out of a total of 27,467, or 89.8 per cent. The average expenditure incurred on account of patients successfully treated was M. 437.05 ($104.02) per case, or M. 5.74 ($1.37) per patient per day. The expenditures incurred on account of patients not successfully treated were M. 338.79 ($80.63) per patient per case, or M. 5.51 ($1.31) per patient per day. The number of female patients successfully treated from an economic point of view during 1910 was 12,669, out of a total number of patients of 13,953, or 90.8 per cent. The average expenditure for female patients successfully treated was M. 355.75 ($84.67) per patient per case, or M. 4.25 ($1.01) per patient per day. The average expenditure on account of female patients unsuccessfully treated amounted to M. 297.54 ($70.81) per patient per case, and M. 4.24 ($1.01) per patient per day.

These results may be accepted as conclusive evidence that the systematic treatment and care of tuberculous wage-earners in the German Empire is today a matter of national policy as conditioned by the exact requirements of the compulsory invalidity insurance laws. The number of wage-earners treated and cared for has steadily increased from year to year, and while in 1905 the number of patients provided for in public sanatoria at the expense of the invalidity insurance institution was 26,834, the number had increased to 46,717, or 74.1 per cent., by 1910. The total expenditures on account of these patients increased from M. 9,685,000 ($2,302,030) in 1905 to M. 17,472,000 ($4,158,336), or 80.4 per cent., in 1910.

It must be self-evident that such large expenditures would not be incurred by government insurance institutions unless on the basis of observed experience the expenditures were justified by the results. Since the law specifically requires that no such expenditures shall be incurred unless there is a reasonable assurance of success for the restoration or conservation of earning capacity as the result of the treatment, there is an immediate and precise relationship between cause and effect, or expenditures incurred and benefits gained. For the purpose of ascertaining the economic results of the treatment and its relation to the expenditures incurred, elaborate reports are required to be made annually by the thirty-one invalidity insurance institutions, and the ten supplementary institutions or pension funds,

and the entire statistical material is annually published in a convenient form by the Imperial Insurance Office, with observations and suggestions, medical or otherwise, as the case may be.*

The post-discharge results are observed for a period of five years. Since the object of the treatment is to prevent invalidity or incapacity for work on account of tuberculosis of the lungs, it is self-evident that the efficacy of the same is determined by the proportion of patients recovering their earning capacity through sanatoria treatment, and their ability to maintain the same for a reasonable period of time. Of 15,516 male patients discharged in 1905, 76 per cent. retained their earning capacity to the end of the first year, 63 per cent. to the end of the second year, 54 per cent. to the end of the third year, 48 per cent. to the end of the fourth year, and 44 per cent. to the end of the fifth year. The results for female patients were still more favorable, and out of 6272 tuberculous women discharged during 1905 the proportion retaining their earning capacity to the end of the first year was 78 per cent., to the end of the second year 67 per cent., to the end of the third year 60 per cent., to the end of the fourth year 55 per cent., and to the end of the fifth year 52 per cent.†

In the main the results of treatment are, of course, determined by the patient's condition on admission. It is natural that an effort should be made to attract the largest possible proportion of patients in the first and second Turban stages of the disease. Of 27,357 male patients admitted for treatment during 1910, the number in the first Turban stage was 13,633, or 49.8 per cent.; the number in the second Turban stage was 10,256, or 37.5 per cent.; and the number in the third Turban stage was 3468, or 12.7 per cent. The corresponding facts for female patients were as follows: Of 13,905 patients admitted, 8648, or 62.2 per cent., were in the first Turban stage of the disease; 4175, or 30 per cent., were in the second; and 1082, or 7.8 per cent., were in the third Turban stage. It is therefore shown that the proportion of patients in the third Turban stage was relatively small, and it is evident that the exceptional facilities for systematic institutional treatment are resulting in the admission of patients during the stages of the disease when the prognosis is most favorable and when, as a rule, a fairly satisfactory economic result can be realized.

The economic importance of the systematic treatment and care of tuber-

* Statistik der Heilbehandlung, 1905–1910. Amtliche Nachrichten des Reichs-Versicherungsamts, 1911. 1. Beiheft. Behrend & Co. Verlag, Berlin, 1911.

† Official Report for 1910, p. 111.

culous wage-earners is precisely shown in the ratio of disability annuities guaranteed on account of tuberculosis of the lungs by German invalidity insurance institutions. The information is available only for the period of 1896–99, but the data are quite conclusive. Out of the total number of annuities granted for all causes at ages twenty to twenty-four the ratio of disability annuities granted on account of tuberculosis of the lungs was 54.9 per cent. for males and 42.6 per cent. for females. At ages twenty-five to twenty-nine the ratio was 50.9 per cent. for males and 34.3 per cent. for females. At ages thirty to thirty-four it was 34.9 per cent. for males and 25.8 per cent. for females; and the ratio remains fairly high until about age forty-five, subsequent to which the proportions become of lesser economic importance. For a full understanding of the results obtained by modern methods of sanatoria treatment, it is necessary to take into account the experience data in detail for the thirty-one territorial invalidity insurance institutions, which are made public annually in the form of carefully prepared reports, amplified by extended medical and general observations.*

The effect of the systematic treatment and care of tuberculous wage-earners in the German Empire is precisely established by the statistical data for the Empire as a whole, the several states and principalities, and the larger cities, considered singly or as a group. Limiting the present consideration to the principal German cities, the death-rate from tuberculosis of the lungs decreased from 34.6 per 10,000 of population during the five years ending with 1884 to 17.9 for the five years ending with 1909, or 48.3 per cent. The lowest rate on record was reached in 1909, when it was only 16.6 per 10,000. In former years the tuberculosis death-rate was higher in German cities than in American cities, but the positions during recent years have been reversed. For the five years ending with 1909 the average tuberculosis death-rate for German cities was 17.9 per 10,000, against a rate of 18.5 for American cities. There are strong reasons for believing that the German advance in the direction of a diminishing tuberculosis death-rate is to be attributed primarily to the systematic and effective treatment and care of tuberculous wage-earners in public sanatoria and the intelligently co-ordinated effort of tuberculosis information bureaus, dispensaries, etc. For the purpose of emphasizing the comparative progress of the campaign against tuberculosis as measured by the decline in the

*A full account of the German System is in course of issue by the U. S. Bureau of Labor. See also Vol. I, 24th Annual Report of the Bureau of Labor, Washington, D. C., 1909.

death-rate, the facts, in detail, are given in the table below by five-year periods since 1880:

COMPARATIVE MORTALITY FROM TUBERCULOSIS OF THE LUNGS IN LARGE GERMAN AND AMERICAN CITIES, 1880–1909

	Rate Per 10,000 of Population in German Cities	American Cities
1880 to 1884	34.6	32.0
1885 to 1889	32.3	28.0
1890 to 1894	27.4	24.5
1895 to 1899	23.6	21.2
1900 to 1904	21.0	19.9
1905 to 1909	17.9	18.5

According to this table the tuberculosis death-rate of German cities has decreased during the last thirty years from an average of 34.6 to 17.9, or 48.3 per cent. The corresponding decrease in the tuberculosis death-rate of American cities has been from 32.0 to 18.5 per 10,000 of population, or 42.2 per cent. As emphasizing the importance of even apparently small differences in the death-rate, it may be stated that if the average death-rate of 17.9 for German cities had prevailed in the case of American cities during the five-year period ending with 1909, the actual number of deaths from tuberculosis of the lungs would have been 148,449, instead of 153,426, or a difference of 4977 lives.

It would carry me too far to give, even in outline, on this occasion, a full account of the nation-wide movement throughout the German Empire for the eradication of tuberculosis of the lungs as a disease primarily of the wage-earning element of the German population. The efforts of government are intelligently co-ordinated to the efforts of private enterprise, and under the efficient direction of the German Central Committee the entire movement is made to rest upon a sound scientific as well as economic and humanitarian basis. Special mention requires to be made of the excellent services rendered by the Woman's Association of the German Red Cross, and of the vast financial expenditures of German invalidity insurance institutions in behalf of the movement for radical and far-reaching reforms in the housing conditions of the wage-earning element of the nation. Up to the end of 1910 the enormous sum of M. 320,000,000 ($76,160,000) had been loaned to municipalities or larger administrative public bodies, to building associations, large employers and individuals, for the purpose of building sanitary and suitable homes for wage-earners, than which there is probably no more important social necessity in the large and densely populated cities of the present day. After, therefore, providing, first, for the

systematic and proper institutional treatment of tuberculous wage-earners in public sanatoria; second, for the establishment of information bureaus and tuberculosis dispensaries; third, for the pecuniary needs of the patient's families, the modern German movement for the control and gradual eradication of the disease comprehends also the most far-reaching and intelligently devised program of housing reform. Whatever opinion may be held with regard to the intrinsic merits of social insurance, it cannot be questioned that the expenditure of a reasonable proportion of the funds of invalidity insurance institutions for general welfare purposes, and with special reference to the improvement of health conditions, and particularly the reduction of the morbidity and mortality from tuberculosis of the lungs, rests upon sound principles of public policy. What has been done in this direction is practically limited to compulsory invalidity insurance institutions, which have nothing essentially in common with life insurance as the business is carried on by private corporations on the mutual or the proprietary plan. It cannot be too often repeated that not a single German life insurance company has undertaken the treatment and care of its tuberculous policy-holders, and in the nature of the life insurance contract it is practically impossible for these institutions to do so. Compulsory insurance against invalidity or wage-earning disability resulting from accident or disease rests upon fundamentally different considerations than life insurance, whether conducted by government or private enterprise. The question, of course, may be raised whether a reasonable proportion of the reserve of life insurance institutions could not be utilized in the furtherance of thoroughly considered plans and purposes of social reform, with special reference to the improvement of conditions more or less detrimental to the health and longevity of the wage-earning element of the nation. What has been done in Germany in this and other directions demands the thoughtful attention of all who are sincerely interested in the administrative control and the gradual eradication of tuberculosis as a social disease and as a menace to the general well-being of the American people of today.

A PRELIMINARY STUDY OF THE VALUE OF SANATORIUM TREATMENT

By Herbert Maxon King, M.D.
Loomis, N. Y.

It is not to be denied that the results so far attained in the cure and prevention of tuberculosis, notwithstanding the wide-spread and energetic anti-tuberculosis campaign of the past ten or twelve years, have been somewhat disappointing. The annual death-rate from this disease in the registration area of the United States is still slightly above 160 per 100,000 population according to the last census reports, and while this shows a reduction of 18.7 per cent. over the decade previous to 1901, the figures are still appalling. The reduction seems hardly commensurate with the energy and money which have been spent so lavishly during this period in the effort to control tuberculosis, unless one keeps in mind the character of the infection and the chronicity of the disease.

Under the circumstances it would seem that one is justified in, if not forced to, a critical inquiry into the relative merits of the means which have been employed. Unfortunately, such an inquiry is at present surrounded by difficulties quite insurmountable. Accurate data for comparison are not available, and in such a matter general impressions are very apt to be misleading; obviously they cannot justify conclusions in an inquiry of this nature. From the census reports, however, we do know that the death-rate from tuberculosis in the registration area of the United States in the decade 1901–1910 was 18.7 per cent. lower than for the previous ten years, while the decline in death-rate from all causes was but 9.7 per cent. This, of itself, is encouraging, but it cannot be with certainty ascribed to any special measure which has been operative. For instance, it would be impossible to say to what extent improved methods of treatment have been responsible for this reduction, and equally impossible to determine what credit is due to specific preventive measures, or what to general improvement in hygiene.

One fact we do recognize, however: tuberculosis is still a very large factor in both the mortality and the morbidity of the race, and while there is no reasonable doubt that a substantial impression has been made upon both the incidence and the fatality of the disease, it is, as yet, little more than an impression, and the problem which confronts us is much more complicated and difficult than seemed to us to be the case ten or fifteen years ago.

The means available for combating tuberculosis may be included under three heads, viz.:

1. General betterment in economic conditions.

2. Segregation, education, and other measures looking to the prevention of *dangerous* contact between the sick and the well.

3. Measures looking to the restoration to health of the sick.

For present purposes the first two factors need not be considered, although the rôle played by institutional treatment in the removal of foci of infection from healthy members of the community and in the hygienic education of virus-carrying patients treated in institutions is no doubt an important one.

The present inquiry is directed to the results of remedial and curative treatment of tuberculous invalids in the sanatorium as determined by their status at a period sufficiently remote from the date of their discharge to justify an opinion as to the permanent value of the treatment, and the restoration to working efficiency of the various groups of patients so treated.

The value of such an inquiry would be greatly enhanced by a comparative study of the results of treatment outside of institutions under otherwise similar conditions and over a contemporary period, but, as has been stated, such a comparison is at present impossible. Such statistics as there are of home and dispensary treatment are not comparable with those of the sanatorium for many reasons, but chiefly because of the different methods employed in their compilation and the failure to employ similar schemata of classification. These objections apply chiefly to treatment in private practice. In the dispensary, methods of classification approach more closely those of the sanatorium, but here, again, comparison is rendered impracticable by the fact that a considerable proportion of dispensary cases have had previous or subsequent sanatorium or climatic treatment.

It is reasonable to suppose that during the past few years, at least, the majority of tuberculous patients who *could* avail themselves of the advantages of the sanatorium would do so, and it is probable that the conditions which prevented other patients from seeking climatic or other treatment

outside the dispensary might also have modified the results of *any* treatment employed. Be this as it may, a fair comparison at present seems impossible.

Under the circumstances, the best alternative would seem to be a statement of the results of treatment after the lapse of sufficient time subsequent to discharge to justify a degree of permanency and an analysis of these results.

With this end in view, I have endeavored to analyze the results of treatment of patients in Loomis Sanatorium over a period of four years (1902 to 1905 inclusive) as determined by the status of these patients on October 31, 1911, or from six to nine years after their discharge from the institution.

Previous to 1902 the system of records employed at Loomis Sanatorium differed from that used subsequently. For this reason, and also because of the increasing difficulty in tracing patients treated in the sanatorium during its earlier years, I have selected for this investigation the four years beginning with 1902.

Because of the relatively small number of patients which this period offers for investigation, allowance must be made for a rather large "deviation from standard," and, therefore, any general conclusions from the figures presented would be unwise.

The purpose of this communication is merely to place on record certain facts applying to groups of patients representing various classified stages of tuberculosis upon admission to the Sanatorium and various classified results of treatment upon discharge, analyzed according to the division of the sanatorium in which they were respectively treated, and as to sex.

No attempt has been made in this inquiry to include an age distribution or otherwise to carry the analysis to an exhaustive subdivision, which would be highly desirable if the number of patients was greater, but which would have little value in an analysis of so limited an amount of material. A much more exhaustive investigation is now in process, involving the study of ultimate results of treatment covering the entire period of sixteen years since Loomis Sanatorium was established. The results of this larger investigation will probably be ready for publication in the course of the next year.

An inquiry like the present, although so limited as to material, clearly demonstrates the uncertainty of apparent immediate results of treatment. It is evident from a study of the appended charts that the value of treatment in the sanatorium (or probably, for that matter, of any treatment of tuberculosis) cannot be measured by the apparent results attained after a

few months' treatment in the institution as classified by condition on discharge.

Tendency to relapse is characteristic of tuberculosis, while, on the other hand, recovery frequently takes place subsequent to discharge when immediate results do not justify classification as "Apparently Cured," "Arrested," or sometimes even "Improved." Again, it frequently happens that a satisfactory condition of health as determined by restoration of working efficiency maintained for many years is not incompatible with physical signs which of themselves would indicate active disease. All these factors should be borne in mind when considering ultimate results of treatment. They cannot be eliminated in an inquiry of this nature, since for the most part records are made up from personal reports of patients, many of whom never consult a physician after leaving the sanatorium.

In the following charts and analysis a word of explanation is necessary. First, as to the terms employed: The classification "Incipient," "Moderately Advanced," etc., has reference to the condition on admission and follows the schema adopted by The National Association for the Study and Prevention of Tuberculosis. Likewise, "Apparently Cured" (C), "Arrested" (A), "Improved" (I), and "Unimproved" (U), have reference to condition on discharge, following the same schema. However, the National Association schema was not adopted until 1905, which has necessitated reclassifying the older cases; this, of course, introduces a certain unavoidable element of error which is further complicated by the less critical methods employed in classifying patients in the earlier years, both as to condition on admission and on discharge, especially the latter.

Another factor which would tend to invalidate broad conclusions drawn from the data submitted in this analysis is the fact that methods of treatment have been modified from year to year, presumably for the better, so that it is probable that a tuberculous patient today has a better chance of restoration to health and working efficiency than was the case ten years ago.

In further explanation of the charts, the term "Health Satisfactory" means that to all appearances the patient is well and living under ordinary conditions as to occupation, residence, etc. "Health Unsatisfactory" means that the patient is unable to follow his or her ordinary occupation, and is either residing in a health resort or living under conditions of invalidism at home. "Status Doubtful" has reference to inadequate reports. So far as is known all the cases tabulated under this head are living, but for one reason or another definite information as to their status has so far not been obtainable.

The Annex Division of Loomis Sanatorium is a charitable and semi-charitable branch of the institution. The patients treated in this division are recruited from the small wage-earning classes whose financial means do not permit of their paying a self-supporting rate, and in numerous instances any rate at all. For obvious reasons it has been much more difficult to trace patients in this division after their discharge. This makes a comparison of results in the two divisions somewhat misleading, and when considered together tends to the apparent disadvantage of treatment.

AN INQUIRY INTO THE PHYSICAL STATUS, ON OCTOBER 31, 1911, OF PATIENTS DISCHARGED ALIVE FROM THE LOOMIS SANATORIUM DURING THE FISCAL YEARS 1902, 1903, 1904, AND 1905

During the four years mentioned, 995 cases passed through the Sanatorium, divided between the Main Sanatorium and the Annex as follows:

Main Sanatorium	719 cases
Annex	276 cases

Of the 995 cases, 135 represent patients who were at the Sanatorium more than once during the period in question. Since it is necessary, in considering ultimate results, to deal with each patient once only, regardless of the number of times he or she was in the institution, we have in these return cases taken the patient's condition on admission and discharge as shown by the *last stay* in the Sanatorium only. This necessitates the discarding of previous visits to the Sanatorium. In the case of the Main Sanatorium, 58 cases are discarded for this reason, leaving 661 patients for this division. Of the Annex cases, 15 are discarded, leaving 261, or a total of 922 patients for both divisions.

From these 922 patients it is necessary, for obvious reasons, to eliminate the following:

MAIN SANATORIUM

Patients who remained in the Sanatorium less than 30 days	116
Patients who died in the Sanatorium	61
Non-tuberculous cases	14
Patients whose condition on admission and discharge is not stated in the records	10
Patients we could not trace, or from whom we have yet to hear	53
Total	254

ANNEX

Patients who remained in the Sanatorium less than 30 days	29
Patients who died in the Sanatorium	2
Non-tuberculous cases	11
Patients whose condition on admission and discharge is not stated in the records	6
Patients we could not trace, or from whom we have yet to hear	73
Total	121
Grand total	375

Deducting these 375 patients from 922, leaves us 547 patients who were discharged alive from the institution during the years mentioned, and who are available for our inquiry.

Before separating these into divisions, we will briefly summarize the results shown for the whole number.

The 547 available patients are divided as follows into sexes:
Males..... 273, or 49.91 per cent. of 547.
Females..... 274, or 50.09 per cent. of 547.

The number of patients alive on October 31, 1911, was—
Males..... 97, or 35.53 per cent. of 273 males.
Females..... 113, or 41.24 per cent. of 274 females.
Total..... 210, or 38.39 per cent. of both sexes.

The number of patients who died before October 31, 1911, was—
Males..... 176, or 64.46 per cent. of 273 males.
Females..... 161, or 58.75 per cent. of 274 females.
Total..... 337, or 61.60 per cent. of both sexes.

Of the 547 patients, there were incipient—
Males..... 39, or 14.28 per cent. of 273 males.
Females..... 39, or 14.23 per cent. of 274 females.
Total..... 78, or 14.25 per cent. of both sexes.

Of the incipient patients, 63, or 80.76 per cent. of both sexes, are alive, and 15, or 19.23 per cent. of both sexes, are dead.

Of the 547 patients, there were moderately advanced—
Males..... 82, or 30.03 per cent. of 273 males.
Females..... 92, or 33.58 per cent. of 274 females.
Total..... 174, or 31.80 per cent. of both sexes.

Of the moderately advanced patients, 94, or 54.02 per cent. of both sexes, are alive, and 80, or 45.97 per cent. of both sexes, are dead.

Of the 547 patients, there were far advanced—
Males..... 152, or 55.67 per cent. of 273 males.
Females..... 143, or 52.18 per cent. of 274 females.
Total..... 295, or 53.93 per cent. of both sexes.

Of the far-advanced patients, 53, or 17.96 per cent., are alive, and 242, or 82.03 per cent. of both sexes, are dead.

(For a more detailed analysis of the results gathered from these 547 patients see Main Sanatorium and Annex Chart No. 1.)

The 547 patients dealt with above are divided between the Main Sanatorium andthe Annex as follows:

Main Sanatorium..... 407, or 74.40 per cent. of total.
Annex..... 140, or 25.60 per cent. of total.

The Main Sanatorium patients, separated from the Annex patients and with the sexes considered separately and together, show as follows:

Males..... 208, or 51.10 per cent. of 407.
Females..... 199, or 48.89 per cent. of 407.

The number of patients alive on October 31, 1911, was—
Males..... 75, or 36.05 per cent. of 208 males.
Females..... 82, or 41.20 per cent. of 199 females.

Total..... 157, or 38.57 per cent. of both sexes.

The number of patients who died before October 31, 1911, was—
Males..... 133, or 63.94 per cent. of 208 males.
Females..... 117, or 58.79 per cent. of 199 females.

Total..... 250, or 61.42 per cent. of both sexes.

Of the 407 patients, there were incipient—
Males..... 30, or 14.42 per cent. of 208 males.
Females..... 27, or 13.56 per cent. of 199 females.

Total..... 57, or 14.00 per cent. of both sexes.

Of the incipient males, 25, or 83.33 per cent., are alive, and 5, or 16.66 per cent., are dead. Of the incipient females, 23, or 85.18 per cent., are alive, and 4, or 14.81 per cent., are dead. Of the incipient, both sexes, 48, or 84.21 per cent., are alive, and 9, or 15.79 per cent., are dead.

Of the 407 patients, there were moderately advanced—
Males..... 63, or 30.28 per cent. of 208 males.
Females..... 65, or 32.66 per cent. of 199 females.

Total.....128, or 31.44 per cent. of both sexes.

Of the moderately advanced males, 34, or 53.97 per cent., are alive, and 29, or 46.03 per cent., are dead. Of the moderately advanced females, 40, or 61.53 per cent., are alive, and 25, or 38.46 per cent., are dead. Of the moderately advanced, both sexes, 74, or 57.81 per cent., are alive, and 54, or 42.18 per cent., are dead.

Of the 407 patients, there were far advanced—
Males..... 115, or 55.28 per cent. of 208 males.
Females..... 107, or 53.76 per cent. of 199 females.

Total..... 222, or 54.54 per cent. of both sexes.

Of the far-advanced males, 16, or 13.91 per cent., are alive, and 99, or 86.09 per cent., are dead. Of the far-advanced females, 19, or 17.75 per cent., are alive, and 88, or 82.24 per cent., are dead. Of the far advanced, both sexes, 35, or 15.76 per cent., are alive, and 187, or 84.23 per cent., are dead.

(For a more detailed analysis of the results gathered from these 407 patients, see Main Sanatorium Charts Nos. 2, 3, and 4.)

The Annex patients, separated from the Main Sanatorium patients, and with the sexes considered separately and together, show as follows:

Males..... 65, or 46.42 per cent. of 140.
Females..... 75, or 53.57 per cent. of 140.

The number of patients alive on October 31, 1911, was—
Males..... 22, or 33.84 per cent. of 65 males.
Females..... 31, or 41.33 per cent. of 75 females.

Total..... 53, or 37.85 per cent. of both sexes.

The number of patients who died before October 31, 1911, was—
Males..... 43, or 66.15 per cent. of 65 males.
Females..... 44, or 58.66 per cent. of 75 females.

Total..... 87, or 62.14 per cent. of both sexes.

Of the 140 patients, there were incipient—
Males..... 9, or 13.84 per cent. of 65 males.
Females..... 12, or 16.00 per cent. of 75 females.

Total..... 21, or 15.00 per cent. of both sexes.

Of the incipient males, 6, or 66.66 per cent., are alive, and 3, or 33.33 per cent., are dead. Of the incipient females, 9, or 75 per cent., are alive, and 3, or 25 per cent., are dead. Of the incipient, both sexes, 15, or 71.42 per cent., are alive, and 6, or 28.57 per cent., are dead.

Of the 140 patients, there were moderately advanced—
Males..... 19, or 29.23 per cent. of 65 males.
Females..... 27, or 36.00 per cent. of 75 females.

Total..... 46, or 32.85 per cent. of both sexes.

Of the moderately advanced males, 6, or 31.57 per cent., are alive, and 13, or 68.42 per cent., are dead. Of the moderately advanced females, 14, or 51.85 per cent., are alive, and 13, or 48.14 per cent., are dead. Of the moderately advanced, both sexes, 20, or 43.47 per cent., are alive, and 26, or 56.52 per cent., are dead.

Of the 140 patients, there were far advanced—
Males..... 37, or 56.93 per cent. of 65 males.
Females..... 36, or 48.00 per cent. of 75 females.

Total..... 73, or 52.15 per cent. of both sexes.

Of the far-advanced males, 10, or 27.02 per cent., are alive, and 27, or 72.97 per cent., are dead. Of the far-advanced females, 8, or 22.22 per cent., are alive, and 28, or 77.78 per cent., are dead. Of the far advanced, both sexes, 18, or 24.65 per cent., are alive, and 55, or 75.35 per cent., are dead.

(For a more detailed analysis of the results gathered from these 140 patients, see Annex Charts Nos. 5, 6, and 7.)

EXPLANATION OF THE PERCENTAGES GIVEN IN THE SQUARES OF THE CHARTS

The percentages contained in the squares of the charts will be more easily understood from the following explanation:

The percentage, for example, given under the head of "Total" in the square marked "Health Satisfactory," Incipient Cases, Main Sanatorium and Annex Chart No. 1, means that 66.66 per cent. of the 78 Incipient Cases, discharged under various conditions, are in a satisfactory condition of health.

The percentage given in the square headed "C," "Health Satisfactory" division of the Incipient Cases, means that of the 43 patients of the Incipient grade who were discharged "Apparently Cured," 67.44 per cent. are in satisfactory health.

The percentages following "Totals," in the second line from the bottom of chart, apply to the total "Apparently Cured" (C), "Arrested" (A), "Improved" (I), and "Unimproved" (U) in *all three classes*—Incipient, Moderately Advanced, and Far Advanced. Thus, under the head of "Total" in the "Health Satisfactory" division, the percentage "28.33" means that of the entire 547 cases covered by the chart, 155 patients, or 28.33 per cent., are in a satisfactory condition of health. The percentages under the squares "C," "A," "I," and "U," in the four divisions—"Health Satisfactory," "Health Unsatisfactory," "Status Doubtful," and "Dead"—apply to the total of the "Apparently Cured," etc., of all three classes—Incipient, Moderately Advanced, and Far Advanced. Thus, of the 547 patients covered by the chart, 102 were "Apparently Cured." In the square headed "C," "Health Satisfactory," 69, or 67.64 per cent., of these 102 patients are shown to be in a satisfactory condition of health.

DETAILED ANALYSIS OF MAIN SANATORIUM AND ANNEX CHART NO. 1

(Males and Females)

Incipient Cases

Of the 547 patients covered by this chart, 78, or 14.25 per cent., were incipient cases.

Of these incipient cases, 52, or 66.66 per cent., are in a satisfactory condition of health; 4, or 5.12 per cent., are in an unsatisfactory condition of health; the status of 7, or 8.97 per cent., is doubtful, and 15, or 19.23 per cent., are dead.

MAIN SANATORIUM AND ANNEX, CHART 1. Males and Females—547 Patients Discharged Alive from Both Divisions

Incipient Cases, 78 = 14.25 Per Cent. of 547

Condition on Oct. 31, 1911	Health Satisfactory					Health Unsatisfactory					Status Doubtful					Dead					Totals	
Condition on Discharge	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	Apparently Cured,	43 = 55.12% of 78
	67.44	60.00	73.33	..	66.66	6.97	..	6.66	..	5.12	9.30	10.00	6.66	..	8.97	16.27	30.00	13.33	..	19.23	Arrested,	20 = 25.64% of 78
Number of Patients	29	12	11	..	52	3	..	1	..	4	4	2	1	..	7	7	6	2	..	15	Improved,	15 = 19.23% of 78
																					Unimproved,	0

Moderately Advanced Cases, 174 = 31.80 Per Cent. of 547

Condition on Oct. 31, 1911	Health Satisfactory					Health Unsatisfactory					Status Doubtful					Dead					Totals	
Condition on Discharge	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	Apparently Cured,	49 = 28.15% of 174
	65.30	42.85	24.44	5.88	40.80	6.12	9.52	4.44	..	6.32	12.24	3.17	6.66	5.88	6.89	16.32	44.44	64.44	88.23	45.97	Arrested,	63 = 36.20% of 174
Number of Patients	32	27	11	1	71	3	6	2	..	11	6	2	3	1	12	8	28	29	15	80	Improved,	45 = 25.86% of 174
																					Unimproved,	17 = 9.77% of 174

Far-advanced Cases, 295 = 53.93 Per Cent. of 547

Condition on Oct. 31, 1911	Health Satisfactory					Health Unsatisfactory					Status Doubtful					Dead					Totals	
Condition on Discharge	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	Apparently Cured,	10 = 3.38% of 295
	80.00	23.52	8.73	0.92	10.84	..	5.88	5.55	..	3.38	..	3.92	4.76	2.77	3.75	20.00	66.66	80.95	96.29	82.03	Arrested,	51 = 17.28% of 295
Number of Patients	8	12	11	1	32	..	3	7	..	10	..	2	6	3	11	2	34	102	104	242	Improved,	126 = 42.71% of 295
Totals	67.64 69	38.05 51	17.74 33	1.60 2	28.33 155	5.88 6	6.71 9	5.37 10	.. ..	4.57 25	9.80 10	4.47 6	5.37 10	3.20 4	5.48 30	16.66 17	50.75 68	71.50 133	95.30 119	61.60 337	Unimproved,	108 = 36.61% of 295

Total Apparently Cured, 102 = 18.64% of 547. Total Arrested, 134 = 24.49% of 547. Total Improved, 186 = 34% of 547. Total Unimproved, 125 = 22.85% of 547.

Of these 78 incipient cases, 43, or 55.12 per cent., were discharged apparently cured; and of these apparently cured patients 29, or 67 44 per cent., are in a satisfactory condition of health; 3, or 6.97 per cent., are in an unsatisfactory condition of health; 4, or 9.30 per cent., are in doubtful condition, and 7, or 16.27 per cent., are dead.

Twenty, or 25.64 per cent., of these incipient cases were discharged arrested; and of these arrested cases 12, or 60 per cent., are in a satisfactory condition of health, the status of 2, or 10 per cent., is doubtful, and 6, or 30 per cent., are dead.

Fifteen, or 19.23 per cent., of these incipient cases were discharged improved; and of these improved patients, 11, or 73.33 per cent., are in a satisfactory condition of health, 1, or 6.66 per cent., is in an unsatisfactory condition of health, the status of 1, or 6.66 per cent., is doubtful, and 2, or 13.33 per cent., are dead.

Moderately Advanced Cases

One hundred seventy-four, or 31.80 per cent., of these cases were moderately advanced.

Of these moderately advanced cases, 71, or 40.80 per cent., are in a satisfactory condition of health; 11, or 6.32 per cent., are in an unsatisfactory condition of health; the status of 12, or 6.89 per cent., is doubtful, and 80, or 45.97 per cent., are dead.

Forty-nine, or 28.15 per cent., of these moderately advanced cases were discharged apparently cured. Of these apparently cured patients, 32, or 65.30 per cent., are in a satisfactory condition of health; 3, or 6.12 per cent., are in an unsatisfactory condition of health; the status of 6, or 12.24 per cent., is doubtful, and 8, or 16.32 per cent., are dead.

Sixty-three, or 36.20 per cent., of these moderately advanced cases were discharged arrested. Of these arrested patients, 27, or 42.85 per cent., are in a satisfactory condition of health; 6, or 9.52 per cent., are in an unsatisfactory condition of health; the status of 2, or 3.17 per cent., is doubtful, and 28, or 44.44 per cent., are dead.

Forty-five, or 25.86 per cent., of these moderately advanced cases were discharged improved. Of these improved patients, 11, or 24.44 per cent., are in a satisfactory condition of health; 2, or 4.44 per cent., are in an unsatisfactory condition of health; the status of 3, or 6.66 per cent., is doubtful, and 29, or 64.44 per cent., are dead.

Seventeen, or 9.77 per cent., of these moderately advanced cases were discharged unimproved. Of these unimproved patients, 1, or 5.88 per cent., is in a satisfactory condition of health; the status of 1, or 5.88 per cent., is doubtful, and 15, or 88.23 per cent., are dead.

Far-advanced Cases

Two hundred ninety-five, or 53.93 per cent., of these cases were far advanced.

Of these far-advanced cases, 32, or 10.84 per cent., are in a satisfactory

condition of health; 10, or 3.38 per cent., are in an unsatisfactory condition of health; the status of 11, or 3.75 per cent., is doubtful, and 242, or 82.03 per cent., are dead.

Ten, or 3.38 per cent., of these far-advanced cases were discharged apparently cured. Of these apparently cured patients, 8, or 80 per cent., are in a satisfactory condition of health, and 2, or 20 per cent., are dead.

Fifty-one, or 17.28 per cent., of these far-advanced cases were discharged arrested. Of these arrested patients, 12, or 23.52 per cent., are in a satisfactory condition of health; 3, or 5.88 per cent., are in an unsatisfactory condition of health; the status of 2, or 3.92 per cent., is doubtful, and 34, or 66.66 per cent., are dead.

One hundred twenty-six, or 42.71 per cent., of these far-advanced cases were discharged improved. Of these improved patients, 11, or 8.73 per cent., are in a satisfactory condition of health; 7, or 5.55 per cent., are in an unsatisfactory condition of health; the status of 6, or 4.76 per cent., is doubtful, and 102, or 80.95 per cent., are dead.

One hundred eight, or 36.61 per cent., of these far-advanced cases were discharged unimproved. Of these unimproved patients, 1, or 0.92 per cent., is in a satisfactory condition of health; the status of 3, or 2.77 per cent., is doubtful, and 104, or 96.29 per cent., are dead.

All Classes Combined

Of all classes combined, 155, or 28.33 per cent., are in a satisfactory condition of health; 25, or 4.57 per cent., are in an unsatisfactory condition of health; the status of 30, or 5.48 per cent., is doubtful, and 337, or 61.60 per cent., are dead.

One hundred two, or 18.64 per cent., of these combined classes were discharged apparently cured. Of these apparently cured patients, 69, or 67.64 per cent., are in a satisfactory condition of health; 6, or 5.88 per cent., are in an unsatisfactory condition of health; the status of 10, or 9.80 per cent., is doubtful, and 17, or 16.66 per cent., are dead.

One hundred thirty-four, or 24.49 per cent., of these combined classes were discharged arrested. Of these arrested patients, 51, or 38.05 per cent., are in a satisfactory condition of health; 9, or 6.71 per cent., are in an unsatisfactory condition of health; the status of 6, or 4.47 per cent., is doubtful, and 68, or 50.75 per cent., are dead.

One hundred eighty-six, or 34 per cent., of these combined classes were discharged improved. Of these improved patients, 33, or 17.74 per cent., are in a satisfactory condition of health; 10, or 5.37 per cent., are in an unsatisfactory condition of health; the status of 10, or 5.37 per cent., is doubtful, and 133, or 71.50 per cent., are dead.

One hundred twenty-five, or 22.85 per cent., of these combined classes were discharged unimproved. Of these unimproved patients, 2, or 1.60 per cent., are in a satisfactory condition of health; the status of 4, or 3.20 per cent., is doubtful, and 119, or 95.20 per cent., are dead.

MAIN SANATORIUM CHART 2. Males and Females—407 Patients Discharged Alive from Main Sanatorium

Incipient Cases, 57 = 14 Per Cent. of 407

Condition on Oct. 31, 1911	Health Satisfactory					Health Unsatisfactory					Status Doubtful					Dead					Totals	
Condition on Discharge	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	Apparently Cured,	35 = 61.40% of 57
	74.28	69.23	77.77	..	73.68	8.57	..	11.11	..	7.01	2.85	7.69	..	..	3.50	14.28	23.07	11.11	..	15.79	Arrested,	13 = 22.80% of 57
Number of Patients.	26	9	7	..	42	3	..	1	..	4	1	1	..	..	2	5	3	1	..	9	Improved,	9 = 15.79% of 57
																					Unimproved,	0

Moderately Advanced Cases, 128 = 31.44 Per Cent. of 407

Condition on Oct. 31, 1911	Health Satisfactory					Health Unsatisfactory					Status Doubtful					Dead					Totals	
Condition on Discharge	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	Apparently Cured,	35 = 27.34% of 128
	71.42	48.89	27.02	9.09	45.31	5.71	8.88	5.41	..	6.25	8.57	4.44	8.10	..	6.25	14.28	37.78	59.46	90.90	42.18	Arrested,	45 = 35.15% of 128
Number of Patients.	25	22	10	1	58	2	4	2	..	8	3	2	3	..	8	5	17	22	10	54	Improved,	37 = 28.90% of 128
																					Unimproved,	11 = 8.59% of 128

Far-advanced Cases, 222 = 54.54 Per Cent. of 407

Condition on Oct. 31, 1911	Health Satisfactory					Health Unsatisfactory					Status Doubtful					Dead					Totals	
Condition on Discharge	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	Apparently Cured,	6 = 2.70% of 222
	83.33	27.77	5.43	1.13	9.45	..	5.55	7.60	..	4.05	..	..	4.34	1.13	2.25	16.66	66.66	82.61	97.72	84.23	Arrested,	36 = 16.21% of 222
Number of Patients.	5	10	5	1	21	..	2	7	..	9	..	..	4	1	5	1	24	76	86	187	Improved,	92 = 41.44% of 222
	73.68	43.61	15.94	2.02	29.75	6.57	6.38	7.24	..	5.15	5.26	3.19	5.07	1.01	3.68	14.47	46.80	71.73	96.96	61.42		
Totals	56	41	22	2	121	5	6	10	..	21	4	3	7	1	15	11	44	99	96	250	Unimproved,	88 = 39.63% of 222

Total Apparently Cured, 76 = 18.67% of 407. Total Arrested, 94 = 23.09% of 407. Total Improved, 138 = 33.90% of 407. Total Unimproved, 99 = 24.32% of 407.

DETAILED ANALYSIS OF MAIN SANATORIUM CHART NO. 2

(Males and Females)

Incipient Cases

Of the 407 patients covered by this chart, 57, or 14 per cent., were incipient cases.

Of these incipient cases, 42, or 73.68 per cent., are in a satisfactory condition of health; 4, or 7.01 per cent., are in an unsatisfactory condition of health; 2, or 3.50 per cent., are of doubtful status, and 9, or 15.79 per cent., are dead.

Thirty-five, or 61.40 per cent., of these incipient cases were discharged apparently cured. Twenty-six, or 74.28 per cent., of these apparently cured patients are in a satisfactory condition of health; 3, or 8.57 per cent., are in an unsatisfactory condition of health; the status of 1, or 2.85 per cent., is doubtful, and 5, or 14.28 per cent., are dead.

Thirteen, or 22.80 per cent., of these incipient cases were discharged arrested. Of these arrested patients, 9, or 69.23 per cent., are in a satisfactory condition of health; the status of 1, or 7.69 per cent., is doubtful, and 3, or 23.07 per cent., are dead.

Nine, or 15.79 per cent., of these incipient cases were discharged improved. Of these improved patients, 7, or 77.77 per cent., are in a satisfactory condition of health; 1, or 11.11 per cent., is in an unsatisfactory condition of health, and 1, or 11.11 per cent., is dead.

Moderately Advanced Cases

One hundred twenty-eight, or 31.44 per cent., of these cases were moderately advanced.

Of these moderately advanced cases, 58, or 45.31 per cent., are in a satisfactory condition of health; 8, or 6.25 per cent., are in an unsatisfactory condition of health; the status of 8, or 6.25 per cent., is doubtful, and 54, or 42.18 per cent., are dead.

Thirty-five, or 27.34 per cent., of these moderately advanced cases were discharged apparently cured. Of these apparently cured patients, 25, or 71.42 per cent., are in a satisfactory condition of health; 2, or 5.71 per cent., are in an unsatisfactory condition of health; the status of 3, or 8.57 per cent., is doubtful, and 5, or 14.28 per cent., are dead.

Forty-five, or 35.15 per cent., of these moderately advanced cases were discharged arrested. Of these arrested patients, 22, or 48.89 per cent., are in a satisfactory condition of health; 4, or 8.88 per cent., are in an unsatisfactory condition of health; the status of 2, or 4.44 per cent., is doubtful, and 17, or 37.78 per cent., are dead.

Thirty-seven, or 28.90 per cent., of these moderately advanced cases were discharged improved. Of these improved patients, 10, or 27.02 per cent., are in a satisfactory condition of health; 2, or 5.41 per cent., are in

an unsatisfactory condition of health; the status of 3, or 8.10 per cent., is doubtful, and 22, or 59.46 per cent., are dead.

Eleven, or 8.59 per cent., of these moderately advanced cases were discharged unimproved. Of these unimproved patients, 1, or 9.09 per cent., is in a satisfactory condition of health, and 10, or 90.90 per cent., are dead.

Far-advanced Cases

Two hundred twenty-two, or 54.54 per cent., of these cases were far advanced.

Of these far-advanced cases, 21, or 9.45 per cent., are in a satisfactory condition of health; 9, or 4.05 per cent., are in an unsatisfactory condition of health; the status of 5, or 2.25 per cent., is doubtful, and 187, or 84.23 per cent., are dead.

Six, or 2.70 per cent., of these far-advanced cases were discharged apparently cured. Of these apparently cured patients, 5, or 83.33 per cent., are in a satisfactory condition of health, and 1, or 16.66 per cent., is dead.

Thirty-six, or 16.21 per cent., of these far-advanced cases were discharged arrested. Of these arrested patients, 10, or 27.77 per cent., are in a satisfactory condition of health; 2, or 5.55 per cent., are in an unsatisfactory condition of health, and 24, or 66.66 per cent., are dead.

Ninety-two, or 41.44 per cent., of these far-advanced cases were discharged improved. Of these improved patients, 5, or 5.43 per cent., are in a satisfactory condition of health; 7, or 7.60 per cent., are in an unsatisfactory condition of health; the status of 4, or 4.34 per cent., is doubtful, and 76, or 82.61 per cent., are dead.

Eighty-eight, or 39.63 per cent., of these far-advanced cases were discharged unimproved. Of these unimproved patients 1, or 1.13 per cent., is in a satisfactory condition of health; the status of 1, or 1.13 per cent., is doubtful, and 86, or 97.72 per cent., are dead.

All Classes Combined

Of all classes combined, 121, or 29.75 per cent., are in a satisfactory condition of health; 21, or 5.15 per cent., are in an unsatisfactory condition of health; the status of 15, or 3.68 per cent., is doubtful, and 250, or 61.42 per cent., are dead.

Seventy-six, or 18.67 per cent., of these combined classes were discharged apparently cured. Of these apparently cured patients, 56, or 73.68 per cent., are in a satisfactory condition of health; 5, or 6.57 per cent., are in an unsatisfactory condition of health; the status of 4, or 5.26 per cent., is doubtful, and 11, or 14.47 per cent., are dead.

Ninety-four, or 23.09 per cent., of these combined classes were discharged arrested. Of these arrested patients, 41, or 43.61 per cent., are in a satisfactory condition of health; 6, or 6.38 per cent., are in an unsatisfactory condition of health; the status of 3, or 3.19 per cent., is doubtful, and 44, or 46.80 per cent., are dead.

One hundred thirty-eight, or 33.90 per cent., of these combined classes

were discharged improved. Of these improved patients, 22, or 15.94 per cent., are in a satisfactory condition of health; 10, or 7.24 per cent., are in an unsatisfactory condition of health; the status of 7, or 5.07 per cent., is doubtful, and 99, or 71.73 per cent., are dead.

Ninety-nine, or 24.32 per cent., of these combined classes were discharged unimproved. Of these unimproved patients, 2, or 2.02 per cent., are in a satisfactory condition of health; the status of 1, or 1.01 per cent., is doubtful, and 96, or 96.96 per cent., are dead.

DETAILED ANALYSIS OF MAIN SANATORIUM CHART NO. 3

(Males)

Incipient Cases

Of the 208 patients covered by this chart, 30, or 14.42 per cent., were incipient cases.

Of these incipient cases, 21, or 70 per cent., are in a satisfactory condition of health; 2, or 6.66 per cent., are in an unsatisfactory condition of health; the status of 2, or 6.66 per cent., is doubtful, and 5, or 16.66 per cent., are dead.

Nineteen, or 63.33 per cent., of these incipient cases were discharged apparently cured. Of these apparently cured patients, 15, or 78.94 per cent., are in a satisfactory condition of health; 1, or 5.26 per cent., is in an unsatisfactory condition of health; the status of 1, or 5.26 per cent., is doubtful, and 2, or 10.52 per cent., are dead.

Nine, or 30 per cent., of these incipient cases were discharged arrested. Of these arrested patients, 5, or 55.55 per cent., are in a satisfactory condition of health; the status of 1, or 11.11 per cent., is doubtful, and 3, or 33.33 per cent., are dead.

Two, or 6.66 per cent., of these incipient cases were discharged improved. Of these improved patients, 1, or 50 per cent., is in a satisfactory condition of health, and 1, or 50 per cent., is in an unsatisfactory condition of health.

Moderately Advanced Cases

Sixty-three, or 30.28 per cent., of these cases were moderately advanced.

Of these moderately advanced cases, 27, or 42.85 per cent., are in a satisfactory condition of health; 4, or 6.34 per cent., are in an unsatisfactory condition of health; the status of 3, or 4.76 per cent., is doubtful, and 29, or 46.03 per cent., are dead.

Sixteen, or 25.39 per cent., of these moderately advanced cases were discharged apparently cured. Of these apparently cured patients, 11, or 68.75 per cent., are in a satisfactory condition of health; 1, or 6.25 per cent., is in an unsatisfactory condition of health; the status of 1, or 6.25 per cent., is doubtful, and 3, or 18.75 per cent., are dead.

Twenty-five, or 39.68 per cent., of these moderately advanced cases were discharged arrested. Of these arrested patients, 11, or 44 per cent.,

MAIN SANATORIUM CHART 3. Males—208 Patients = 51.10 Per Cent. of Total Number of Patients at Main Sanatorium

Incipient Cases, 30 = 14.42 Per Cent. of 208

Condition on Oct. 31, 1911	Health Satisfactory					Health Unsatisfactory					Status Doubtful					Dead					Totals	
Condition on Discharge	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	Apparently Cured,	19 = 63.33% of 30
	78.94	55.55	50.00	..	70.00	5.26	..	50.00	..	6.66	5.26	11.11	..	..	6.66	10.52	33.33	..	..	16.66	Arrested,	9 = 30.00% of 30
Number of Patients	15	5	1	..	21	1	..	1	..	2	1	1	..	..	2	2	3	..	..	5	Improved,	2 = 6.66% of 30
																					Unimproved,	0

Moderately Advanced Cases, 63 = 30.28 Per Cent. of 208

Condition on Oct. 31, 1911	Health Satisfactory					Health Unsatisfactory					Status Doubtful					Dead					Totals	
Condition on Discharge	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	Apparently Cured,	16 = 25.39% of 63
	68.75	44.00	27.77	..	42.85	6.25	8.00	5.55	..	6.34	6.25	4.00	5.55	..	4.76	18.75	44.00	61.11	100.00	46.03	Arrested,	25 = 39.68% of 63
Number of Patients	11	11	5	..	27	1	2	1	..	4	1	1	1	..	3	3	11	11	4	29	Improved,	18 = 28.57% of 63
																					Unimproved,	4 = 6.34% of 63

Far-advanced Cases, 115 = 55.28 Per Cent. of 208

Condition on Oct. 31, 1911	Health Satisfactory					Health Unsatisfactory					Status Doubtful					Dead					Totals	
Condition on Discharge	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	Apparently Cured,	2 = 1.73% of 115
	100.00	23.80	3.57	..	7.82	..	9.52	3.57	..	3.47	..	..	3.57	2.77	2.60	..	66.66	89.28	97.22	86.09	Arrested,	21 = 18.26% of 115
Number of Patients	2	5	2	..	9	..	2	2	..	4	..	..	2	1	3	..	14	50	35	99	Improved,	56 = 48.69% of 115
Totals	75.67 28	38.18 21	10.52 8	..	27.40 57	5.40 2	7.27 4	5.26 4	..	4.80 10	5.40 2	3.63 2	3.94 3	2.50 1	3.84 8	13.51 5	50.90 28	80.26 61	97.50 39	63.94 133	Unimproved,	36 = 31.30% of 115

Total Apparently Cured, 37 = 17.78% of 208. Total Arrested, 55 = 26.44% of 208. Total Improved, 76 = 36.53% of 208. Total Unimproved, 40 = 19.23% of 208.

are in a satisfactory condition of health; 2, or 8 per cent., are in an unsatisfactory condition of health; the status of 1, or 4 per cent., is doubtful, and 11, or 44 per cent., are dead.

Eighteen, or 28.57 per cent., of these moderately advanced cases were discharged improved. Of these improved patients, 5, or 27.77 per cent., are in a satisfactory condition of health; 1, or 5.55 per cent., is in an unsatisfactory condition of health; the status of 1, or 5.55 per cent., is doubtful, and 11, or 61.11 per cent., are dead.

Four, or 6.34 per cent., of these moderately advanced cases were discharged unimproved. Of these unimproved patients, 4, or 100 per cent., are dead.

Far-advanced Cases

One hundred fifteen, or 55.28 per cent., of these cases were far advanced.

Of these far-advanced cases, 9, or 7.82 per cent., are in a satisfactory condition of health; 4, or 3.47 per cent., are in an unsatisfactory condition of health; 3, or 2.60 per cent., are of doubtful status, and 99, or 86.09 per cent., are dead.

Two, or 1.73 per cent., of these far-advanced cases were discharged apparently cured. Of these apparently cured patients, 2, or 100 per cent., are in a satisfactory condition of health.

Twenty-one, or 18.26 per cent., of these far-advanced cases were discharged arrested. Of these arrested patients, 5, or 23.80 per cent., are in a satisfactory condition of health; 2, or 9.52 per cent., are in an unsatisfactory condition of health, and 14, or 66.66 per cent., are dead.

Fifty-six, or 48.69 per cent., of these far-advanced cases were discharged improved. Of these improved patients, 2, or 3.57 per cent., are in a satisfactory condition of health; 2, or 3.57 per cent., are in an unsatisfactory condition of health; the status of 2, or 3.57 per cent., is doubtful, and 50, or 89.28 per cent., are dead.

Thirty-six, or 31.30 per cent., of these far-advanced cases were discharged unimproved. Of these unimproved patients, the status of 1, or 2.77 per cent., is doubtful, and 35, or 97.22 per cent., are dead.

All Classes Combined

Of all classes combined, 57, or 27.40 per cent., are in a satisfactory condition of health; 10, or 4.80 per cent., are in an unsatisfactory condition of health; the status of 8, or 3.84 per cent., is doubtful, and 133, or 63.94 per cent., are dead.

Thirty-seven, or 17.78 per cent., of these combined classes were discharged apparently cured. Of these apparently cured patients, 28, or 75.67 per cent., are in a satisfactory condition of health; 2, or 5.40 per cent., are in an unsatisfactory condition of health; the status of 2, or 5.40 per cent., is doubtful, and 5, or 13.51 per cent., are dead.

Fifty-five, or 26.44 per cent., of these combined classes were discharged

arrested. Of these arrested patients, 21, or 38.18 per cent., are in a satisfactory condition of health; 4, or 7.27 per cent., are in an unsatisfactory condition of health; the status of 2, or 3.63 per cent., is doubtful, and 28, or 50.90 per cent., are dead.

Seventy-six, or 36.53 per cent., of these combined classes were discharged improved. Of these improved patients, 8, or 10.52 per cent., are in a satisfactory condition of health; 4, or 5.26 per cent., are in an unsatisfactory condition of health; the status of 3, or 3.94 per cent., is doubtful, and 61, or 80.26 per cent., are dead.

Forty, or 19.23 per cent., of these combined classes were discharged unimproved. Of these unimproved patients, the status of 1, or 2.50 per cent., is doubtful, and 39, or 97.50 per cent., are dead.

DETAILED ANALYSIS OF MAIN SANATORIUM CHART NO. 4

(Females)

Incipient Cases

Of the 199 patients covered by this chart, 27, or 13.56 per cent., were incipient cases.

Of these incipient cases, 21, or 77.77 per cent., are in a satisfactory condition of health; 2, or 7.40 per cent., are in an unsatisfactory condition of health, and 4, or 14.81 per cent., are dead.

Sixteen, or 59.25 per cent., of these incipient cases were discharged apparently cured. Of these apparently cured patients, 11, or 68.75 per cent., are in a satisfactory condition of health; 2, or 12.50 per cent., are in an unsatisfactory condition of health, and 3, or 18.75 per cent., are dead.

Four, or 14.81 per cent., of these incipient cases were discharged arrested. Of these arrested cases, 4, or 100 per cent., are in a satisfactory condition of health.

Seven, or 25.92 per cent., of these incipient cases were discharged improved. Of these improved patients, 6, or 85.71 per cent., are in a satisfactory condition of health, and 1, or 14.28 per cent., is dead.

Moderately Advanced Cases

Sixty-five, or 32.66 per cent., of these cases were moderately advanced.

Of these moderately advanced cases, 31, or 47.69 per cent., are in a satisfactory condition of health; 4, or 6.15 per cent., are in an unsatisfactory condition of health; the status of 5, or 7.69 per cent., is doubtful, and 25, or 38.46 per cent., are dead.

Nineteen, or 29.23 per cent., of these moderately advanced cases were discharged apparently cured. Of these apparently cured patients, 14, or 73.68 per cent., are in a satisfactory condition of health; 1, or 5.26 per cent., is in an unsatisfactory condition of health; the status of 2, or 10.52 per cent., is doubtful, and 2, or 10.52 per cent., are dead.

Twenty, or 30.76 per cent., of these moderately advanced cases were

MAIN SANATORIUM CHART 4. FEMALES—199 PATIENTS = 48.89 PER CENT. OF TOTAL NUMBER OF PATIENTS AT MAIN SANATORIUM

INCIPIENT CASES, 27 = 13.56 PER CENT. OF 199

Condition on Oct. 31, 1911	HEALTH SATISFACTORY					HEALTH UNSATISFACTORY					STATUS DOUBTFUL					DEAD					TOTALS	
Condition on Discharge	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total		
	68.75	100.00	85.71	..	77.77	12.50	..	..	..	7.40	..	..	..	..	..	18.75	..	14.28	..	14.81	Apparently Cured,	16 = 59.25% of 27
Number of Patients	11	4	6	..	21	2	..	..	..	2	..	..	..	..	..	3	..	1	..	4	Arrested,	4 = 14.81% of 27
																					Improved,	7 = 25.92% of 27
																					Unimproved,	0

MODERATELY ADVANCED CASES, 65 = 32.66 PER CENT. OF 199

Condition on Oct. 31, 1911	HEALTH SATISFACTORY					HEALTH UNSATISFACTORY					STATUS DOUBTFUL					DEAD					TOTALS	
Condition on Discharge	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total		
	73.68	55.00	26.33	14.28	47.69	5.26	10.00	5.26	..	6.15	10.52	5.00	10.52	..	7.69	10.52	30.00	57.89	85.71	38.46	Apparently Cured,	19 = 29.23% of 65
Number of Patients	14	11	5	1	31	1	2	1	..	4	2	1	2	..	5	2	6	11	6	25	Arrested,	20 = 30.76% of 65
																					Improved,	19 = 29.23% of 65
																					Unimproved,	7 = 10.76% of 65

FAR-ADVANCED CASES, 107 = 53.76 PER CENT. OF 199

Condition on Oct. 31, 1911	HEALTH SATISFACTORY					HEALTH UNSATISFACTORY					STATUS DOUBTFUL					DEAD					TOTALS	
Condition on Discharge	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total		
	75.00	33.33	8.33	1.92	11.21	..	..	13.88	..	4.67	..	..	5.55	..	1.86	25.00	66.66	72.22	98.07	82.24	Apparently Cured,	4 = 3.73% of 107
Number of Patients	3	5	3	1	12	..	..	5	..	5	..	..	2	..	2	1	10	26	51	88	Arrested,	15 = 14.01% of 107
																					Improved,	36 = 33.64% of 107
Totals	71.79	51.28	22.58	3.38	32.16	7.60	5.12	9.67	..	5.52	5.12	2.56	6.45	..	3.51	15.38	41.02	61.29	96.61	58.79	Unimproved,	52 = 48.60% of 107
	28	20	14	2	64	3	2	6	..	11	2	1	4	..	7	6	16	38	57	117		

Total Apparently Cured, 39 = 19.59% of 199. Total Arrested, 39 = 19.59% of 199. Total Improved, 62 = 31.15% of 199. Total Unimproved, 59 = 29.65% of 199.

discharged arrested. Of these arrested patients, 11, or 55 per cent., are in a satisfactory condition of health; 2, or 10 per cent., are in an unsatisfactory condition of health; the status of 1, or 5 per cent., is doubtful, and 6, or 30 per cent., are dead.

Nineteen, or 29.23 per cent., of these moderately advanced cases were discharged improved. Of these improved patients, 5, or 26.33 per cent., are in a satisfactory condition of health; 1, or 5.26 per cent., is in an unsatisfactory condition of health; the status of 2, or 10.52 per cent., is doubtful, and 11, or 57.89 per cent., are dead.

Seven, or 10.76 per cent., of these moderately advanced cases were discharged unimproved. Of these unimproved patients, 1, or 14.28 per cent., is in a satisfactory condition of health, and 6, or 85.71 per cent., are dead.

Far-advanced Cases

One hundred seven, or 53.76 per cent., of these cases were far advanced.

Of these far-advanced cases, 12, or 11.21 per cent., are in a satisfactory condition of health; 5, or 4.67 per cent., are in an unsatisfactory condition of health; the status of 2, or 1.86 per cent., is doubtful, and 88, or 82.24 per cent., are dead.

Four, or 3.73 per cent., of these far-advanced cases were discharged apparently cured. Of these apparently cured patients, 3, or 75 per cent., are in a satisfactory condition of health, and 1, or 25 per cent., is dead.

Fifteen, or 14.01 per cent., of these far-advanced cases were discharged arrested. Of these arrested patients, 5, or 33.33 per cent., are in a satisfactory condition of health, and 10, or 66.66 per cent., are dead.

Thirty-six, or 33.64 per cent., of these far-advanced cases were discharged improved. Of these improved patients, 3, or 8.33 per cent., are in a satisfactory condition of health; 5, or 13.88 per cent., are in an unsatisfactory condition of health; the status of 2, or 5.55 per cent., is doubtful, and 26, or 72.22 per cent., are dead.

Fifty-two, or 48.60 per cent., of these far-advanced cases were discharged unimproved. Of these unimproved patients, 1, or 1.92 per cent., is in a satisfactory condition of health, and 51, or 98.07 per cent., are dead.

All Classes Combined

Of all classes combined, 64, or 32.16 per cent., are in a satisfactory condition of health; 11, or 5.52 per cent., are in an unsatisfactory condition of health; the status of 7, or 3.51 per cent., is doubtful, and 117, or 58.79 per cent., are dead.

Thirty-nine, or 19.59 per cent., of these combined classes were discharged apparently cured. Of these apparently cured patients, 28, or 71.79 per cent., are in a satisfactory condition of health; 3, or 7.69 per cent., are in an unsatisfactory condition of health; the status of 2, or 5.12 per cent., is doubtful, and 6, or 15.38 per cent., are dead.

Thirty-nine, or 19.59 per cent., of these combined classes were discharged

arrested. Of these arrested patients, 20, or 51.28 per cent., are in a satisfactory condition of health; 2, or 5.12 per cent., are in an unsatisfactory condition of health; the status of 1, or 2.56 per cent., is doubtful, and 16, or 41.02 per cent., are dead.

Sixty-two, or 31.15 per cent., of these combined classes were discharged improved. Of these improved patients, 14, or 22.58 per cent., are in a satisfactory condition of health; 6, or 9.67 per cent., are in an unsatisfactory condition of health; the status of 4, or 6.45 per cent., is doubtful, and 38, or 61.29 per cent., are dead.

Fifty-nine, or 29.65 per cent., of these combined classes were discharged unimproved. Of these unimproved patients, 2, or 3.38 per cent., are in a satisfactory condition of health, and 57, or 96.61 per cent., are dead.

DETAILED ANALYSIS OF ANNEX CHART NO. 5

(Males and Females)

Incipient Cases

Of the 140 patients covered by this chart, 21, or 15 per cent., were incipient cases.

Of these incipient cases, 10, or 47.62 per cent., are in a satisfactory condition of health; the status of 5, or 23.80 per cent., is doubtful, and 6, or 28.57 per cent., are dead.

Eight, or 38.09 per cent., of these incipient cases were discharged apparently cured. Of these apparently cured patients, 3, or 37.50 per cent., are in a satisfactory condition of health; the status of 3, or 37.50 per cent., is doubtful, and 2, or 25 per cent., are dead.

Seven, or 33.33 per cent., of these incipient cases were discharged arrested. Of these arrested patients, 3, or 42.85 per cent., are in a satisfactory condition of health; the status of 1, or 14.28 per cent., is doubtful, and 3, or 42.85 per cent., are dead.

Six, or 28.57 per cent., of these incipient cases were discharged improved. Of these improved patients, 4, or 66.66 per cent., are in a satisfactory condition of health; the status of 1, or 16.66 per cent., is doubtful, and 1, or 16.66 per cent., is dead.

Moderately Advanced Cases

Forty-six, or 32.85 per cent., of these cases were moderately advanced

Of these moderately advanced cases, 13, or 28.26 per cent., are in satisfactory health; 3, or 6.52 per cent., are in an unsatisfactory condition of health; the status of 4, or 8.68 per cent., is doubtful, and 26, 56.52 per cent. are dead.

Fourteen, or 30.43 per cent., of these moderately advanced cases were discharged apparently cured. Of these apparently cured patients, 7, or 50 per cent., are in a satisfactory condition of health; 1, or 7.14 per cent.,

ANNEX CHART 5. Males and Females—140 Patients Discharged Alive from Annex

Incipient Cases, 21=15 Per Cent of 140.

Condition on Oct. 31, 1911	Health Satisfactory					Health Unsatisfactory					Status Doubtful					Dead					Totals	
Condition on Discharge	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	Apparently Cured,	8=38.00% of 21
	37.50	42.85	66.66	..	47.62	..	..	..	..	..	37.50	14.28	16.66	..	23.80	25.00	42.85	16.66	..	28.57	Arrested,	7=33.33% of 21
Number of Patients.	3	3	4	..	10	..	..	..	..	..	3	1	1	..	5	2	3	1	..	6	Improved,	6=28.57% of 21
																					Unimproved,	0

Moderately Advanced Cases, 46=32.85 Per Cent. of 140

Condition on Oct. 31, 1911	Health Satisfactory					Health Unsatisfactory					Status Doubtful					Dead					Totals	
Condition on Discharge	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	Apparently Cured,	14=30.43% of 46
	50.00	27.77	12.50	..	28.26	7.14	11.11	..	..	6.52	21.42	..	..	16.66	8.68	21.42	61.11	87.50	83.33	56.52	Arrested,	18=39.13% of 46
Number of Patients.	7	5	1	..	13	1	2	..	..	3	3	..	..	1	4	3	11	7	5	26	Improved,	8=17.39% of 46
																					Unimproved,	6=13.04% of 46

Far-advanced Cases, 73=52.15 Per Cent. of 140

Condition on Oct. 31, 1911	Health Satisfactory					Health Unsatisfactory					Status Doubtful					Dead					Totals	
Condition on Discharge	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	Apparently Cured,	4= 5.47% of 73
	75.00	13.33	17.63	..	15.07	..	6.66	..	..	1.36	..	13.33	5.88	10.00	8.21	25.00	66.66	76.47	90.00	75.35	Arrested,	15=20.57% of 73
Number of Patients.	3	2	6	..	11	..	1	..	..	1	..	2	2	2	6	1	10	26	18	55	Improved,	34=46.57% of 73
	50.00	25.00	22.91	..	24.28	3.84	7.50	..	..	2.85	23.07	7.50	6.25	11.53	10.71	23.07	59.99	70.83	88.46	62.14		
Totals	13	10	11	..	34	1	3	..	..	4	6	3	3	3	15	6	24	34	23	87	Unimproved,	20=27.39% of 73

Total Apparently Cured, 26=18.57% of 140. Total Arrested, 40=28.57% of 140. Total Improved, 48=34.28% of 140. Total Unimproved, 26=18.57% of 140.

is in an unsatisfactory condition of health; the status of 3, or 21.42 per cent., is doubtful, and 3, or 21.42 per cent., are dead.

Eighteen, or 39.13 per cent., of these moderately advanced cases were discharged arrested. Of these arrested patients, 5, or 27.77 per cent., are in a satisfactory condition of health; 2, or 11.11 per cent., are in an unsatisfactory condition of health, and 11, or 61.11 per cent., are dead.

Eight, or 17.39 per cent., of these moderately advanced cases were discharged improved. Of these improved patients, 1, or 12.50 per cent., is in a satisfactory condition of health, and 7, or 87.50 per cent., are dead.

Six, or 13.04 per cent., of these moderately advanced cases were discharged unimproved. Of these unimproved patients, the status of 1, or 16.66 per cent., is doubtful, and 5, or 83.33 per cent., are dead.

Far-advanced Cases

Seventy-three, or 52.15 per cent., of these cases were far advanced.

Of these far-advanced cases, 11, or 15.07 per cent., are in a satisfactory condition of health; 1, or 1.36 per cent., is in an unsatisfactory condition of health; the status of 6, or 8.21 per cent., is doubtful, and 55, or 75.35 per cent., are dead.

Four, or 5.47 per cent., of these far-advanced cases were discharged apparently cured. Of these apparently cured patients, 3, or 75 per cent., are in a satisfactory condition of health, and 1, or 25 per cent., is dead.

Fifteen, or 20.57 per cent., of these far-advanced cases were discharged arrested. Of these arrested patients, 2, or 13.33 per cent., are in a satisfactory condition of health; 1, or 6.66 per cent., is in an unsatisfactory condition of health; the status of 2, or 13.33 per cent., is doubtful, and 10, or 66.66 per cent., are dead.

Thirty-four, or 46.57 per cent., of these far-advanced cases were discharged improved. Of these improved patients, 6, or 17.63 per cent., are in a satisfactory condition of health; the status of 2, or 5.88 per cent., is doubtful, and 26, or 76.47 per cent., are dead.

Twenty, or 27.39 per cent., of these far-advanced cases were discharged unimproved. Of these unimproved patients, the status of 2, or 10 per cent., is doubtful, and 18, or 90 per cent., are dead.

All Classes Combined

Of all classes combined, 34, or 24.28 per cent., are in a satisfactory condition of health; 4, or 2.85 per cent., are in an unsatisfactory condition of health; the status of 15, or 10.71 per cent., is doubtful, and 87, or 62.14 per cent., are dead.

Twenty-six, or 18.57 per cent., of these combined classes were discharged apparently cured. Of these apparently cured patients, 13, or 50 per cent., are in a satisfactory condition of health; 1, or 3.84 per cent., is in an unsatisfactory condition of health; the status of 6, or 23.07 per cent., is doubtful, and 6, or 23.07 per cent., are dead.

Forty, or 28.57 per cent., of these combined classes were discharged

arrested. Of these arrested patients, 10, or 25 per cent., are in a satisfactory condition of health; 3, or 7.50 per cent., are in an unsatisfactory condition of health; the status of 3, or 7.50 per cent., is doubtful, and 24, or 59.99 per cent., are dead.

Forty-eight, or 34.28 per cent., of these combined classes were discharged improved. Of these improved patients, 11, or 22.91 per cent., are in a satisfactory condition of health; the status of 3, or 6.25 per cent., is doubtful, and 34, or 70.83 per cent., are dead.

Twenty-six, or 18.57 per cent., of these combined classes were discharged unimproved. Of these unimproved patients, the status of 3, or 11.53 per cent., is doubtful, and 23, or 88.46 per cent., are dead.

DETAILED ANALYSIS OF ANNEX CHART NO. 6

(Males)

Incipient Cases

Of the 65 patients covered by this chart, 9, or 13.84 per cent., were incipient cases.

Of these incipient cases, 4, or 44.44 per cent., are in a satisfactory condition of health; the status of 2, or 22.22 per cent., is doubtful, and 3, or 33.33 per cent., are dead.

Four, or 44.44 per cent., of these incipient cases were discharged apparently cured. Of these apparently cured cases, 1, or 25 per cent., is in a satisfactory condition of health; the status of 2, or 50 per cent., is doubtful, and 1, or 25 per cent., is dead.

Five, or 55.55 per cent., of these incipient cases were discharged arrested. Of these arrested patients, 3, or 60 per cent., are in a satisfactory condition of health, and 2, or 40 per cent., are dead.

Moderately Advanced Cases

Nineteen, or 29.23 per cent., of these cases were moderately advanced.

Of these moderately advanced cases, 5, or 26.31 per cent., are in a satisfactory condition of health; the status of 1, or 5.26 per cent., is doubtful, and 13, or 68.42 per cent., are dead.

Six, or 31.57 per cent., of these moderately advanced cases were discharged apparently cured. Of these apparently cured patients, 3, or 50 per cent., are in a satisfactory condition of health; the status of 1, or 16.66 per cent., is doubtful, and 2, or 33.33 per cent., are dead.

Six, or 31.57 per cent., of these moderately advanced cases were discharged arrested. Of these arrested patients, 1, or 16.66 per cent., is in a satisfactory condition of health, and 5, or 83.33 per cent., are dead.

Four, or 21.05 per cent., of these moderately advanced cases were discharged improved. Of these improved patients, 1, or 25 per cent., is in a satisfactory condition of health, and 3, or 75 per cent., are dead.

Three, or 15.79 per cent., of these moderately advanced cases were dis-

ANNEX CHART 6. Males—65 Patients = 46.42 Per Cent. of Total Number of Patients at Annex

Incipient Cases, 9 = 13.84 Per Cent. of 65

Condition on Oct. 31, 1911	Health Satisfactory					Health Unsatisfactory					Status Doubtful					Dead					Totals	
Condition on Discharge	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	Apparently Cured,	4 = 44.44% of 9
	25.00	60.00	..	..	44.44	..	..	..	..	..	50.00	..	..	..	22.22	25.00	40.00	..	..	33.33	Arrested,	5 = 55.55% of 9
Number of Patients	1	3	..	..	4	..	..	..	..	..	2	..	..	..	2	1	2	..	..	3	Improved,	0
																					Unimproved,	0

Moderately Advanced Cases, 19 = 29.23 Per Cent. of 65

Condition on Oct. 31, 1911	Health Satisfactory					Health Unsatisfactory					Status Doubtful					Dead					Totals	
Condition on Discharge	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	Apparently Cured,	6 = 31.57% of 19
	50.00	16.66	25.00	..	26.31	..	..	..	..	..	16.66	..	..	..	5.26	33.33	83.33	75.00	100.00	68.42	Arrested,	6 = 31.57% of 19
Number of Patients	3	1	1	..	5	..	..	..	..	..	1	..	..	..	1	2	5	3	3	13	Improved,	4 = 21.05% of 19
																					Unimproved,	3 = 15.79% of 19

Far-advanced Cases, 37 = 56.93 Per Cent. of 65

Condition on Oct. 31, 1911	Health Satisfactory					Health Unsatisfactory					Status Doubtful					Dead					Totals	
Condition on Discharge	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	Apparently Cured,	2 = 5.40% of 37
	100.00	12.50	11.76	..	13.51	..	..	..	..	..	..	25.00	11.76	10.00	13.51	..	62.50	76.46	90.00	72.97	Arrested,	8 = 21.02% of 37
Number of Patients	2	1	2	..	5	..	..	..	..	..	..	2	2	1	5	..	5	13	9	27	Improved,	17 = 45.94% of 37
Totals	50.00	26.31	14.28	..	21.53	..	..	..	..	..	25.00	10.52	9.52	7.69	12.30	25.00	63.15	76.19	92.30	66.15	Unimproved,	10 = 27.02% of 37
	6	5	3	..	14	..	..	..	..	..	3	2	2	1	8	3	12	16	12	43		

Total Apparently Cured, 12 = 18.46% of 65. Total Arrested, 19 = 29.23% of 65. Total Improved, 21 = 32.30% of 65. Total Unimproved, 13 = 20.00% of 65.

charged unimproved. Of these unimproved patients, 3, or 100 per cent., are dead.

Far-advanced Cases

Thirty-seven, or 56.93 per cent., of these cases were far advanced.

Of these far-advanced cases, 5, or 13.51 per cent., are in a satisfactory condition of health; the status of 5, or 13.51 per cent., is doubtful, and 27, or 72.97 per cent., are dead.

Two, or 5.40 per cent., of these far-advanced cases were discharged apparently cured. Of these apparently cured patients, 2, or 100 per cent., are in a satisfactory condition of health.

Eight, or 21.62 per cent., of these far-advanced cases were discharged arrested. Of these arrested patients, 1, or 12.50 per cent., is in a satisfactory condition of health; the status of 2, or 25 per cent., is doubtful, and 5, or 62.50 per cent., are dead.

Seventeen, or 45.94 per cent., of these far-advanced cases were discharged improved. Of these improved patients, 2, or 11.76 per cent., are in a satisfactory condition of health; the status of 2, or 11.76 per cent., is doubtful, and 13, or 76.46 per cent., are dead.

Ten, or 27.02 per cent., of these far-advanced cases were discharged unimproved. Of these unimproved patients, the status of 1, or 10 per cent., is doubtful, and 9, or 90 per cent., are dead.

All Classes Combined

Of all classes combined, 14, or 21.53 per cent., are in a satisfactory condition of health; the status of 8, or 12.30 per cent., is doubtful, and 43, or 66.15 per cent., are dead.

Twelve, or 18.46 per cent., of these combined classes were discharged apparently cured. Of these apparently cured patients, 6, or 50 per cent., are in a satisfactory condition of health; the status of 3, or 25 per cent., is doubtful, and 3, or 25 per cent., are dead.

Nineteen, or 29.23 per cent., of these combined classes were discharged arrested. Of these arrested patients, 5, or 26.31 per cent., are in a satisfactory condition of health; the status of 2, or 10.52 per cent., is doubtful, and 12, or 63.15 per cent., are dead.

Twenty-one, or 32.30 per cent., of these combined classes were discharged improved. Of these improved patients, 3, or 14.28 per cent., are in a satisfactory condition of health; the status of 2, or 9.52 per cent., is doubtful, and 16, or 76.19 per cent., are dead.

Thirteen, or 20 per cent., of these combined classes were discharged unimproved. Of these unimproved patients, the status of 1, or 7.69 per cent., is doubtful, and 12, or 92.30 per cent., are dead.

DETAILED ANALYSIS OF ANNEX CHART NO. 7

(Females)

Incipient Cases

Of the 75 patients covered by this chart, 12, or 16 per cent., were incipient cases.

Of these incipient cases, 6, or 50 per cent., are in a satisfactory condition of health; the status of 3, or 25 per cent., is doubtful, and 3, or 25 per cent., are dead.

Four, or 33.33 per cent., of these incipient cases were discharged apparently cured. Of these apparently cured patients, 2, or 50 per cent., are in a satisfactory condition of health; the status of 1, or 25 per cent., is doubtful, and 1, or 25 per cent., is dead.

Two, or 16.66 per cent., of these incipient cases were discharged arrested. Of these arrested patients, the status of 1, or 50 per cent., is doubtful, and 1, or 50 per cent., is dead.

Six, or 50 per cent., of these incipient cases were discharged improved. Of these improved patients, 4, or 66.66 per cent., are in a satisfactory condition of health; the status of 1, or 16.66 per cent., is doubtful, and 1, or 16.66 per cent., is dead.

Moderately Advanced Cases

Twenty-seven, or 36 per cent., of these cases were moderately advanced.

Of these moderately advanced cases, 8, or 29.62 per cent., are in a satisfactory condition of health; 3, or 11.11 per cent., are in an unsatisfactory condition of health; the status of 3, or 11.11 per cent., is doubtful, and 13, or 48.14 per cent., are dead.

Eight, or 29.62 per cent., of these moderately advanced cases were discharged apparently cured. Of these apparently cured patients, 4, or 50 per cent., are in a satisfactory condition of health; 1, or 12.50 per cent., is in an unsatisfactory condition of health; the status of 2, or 25 per cent., is doubtful, and 1, or 12.50 per cent., is dead.

Twelve, or 44.44 per cent., of these moderately advanced cases were discharged arrested. Of these arrested patients, 4, or 33.33 per cent., are in a satisfactory condition of health; 2, or 16.66 per cent., are in an unsatisfactory condition of health, and 6, or 50 per cent., are dead.

Four, or 14.81 per cent., of these moderately advanced cases were discharged improved. Of these improved patients, 4, or 100 per cent., are dead.

Three, or 11.11 per cent., of these moderately advanced cases were discharged unimproved. Of these unimproved patients, the status of 1, or 33.33 per cent., is doubtful, and 2, or 66.66 per cent., are dead.

Far-advanced Cases

Thirty-six, or 48 per cent., of these cases were far advanced.

Of these far-advanced cases, 6, or 16.66 per cent., are in a satisfactory

ANNEX CHART 7. Females—75 Patients = 53.57 Per Cent. of Total Number of Patients at Annex

Incipient Cases, 12 = 16 Per Cent. of 75

Condition on Oct. 31, 1911	Health Satisfactory					Health Unsatisfactory					Status Doubtful					Dead					Totals	
Condition on Discharge	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	Apparently Cured,	4 = 33.33% of 12
	50.00	..	66.66	..	50.00	..	..	..	..	..	25.00	50.00	16.66	..	25.00	25.00	50.00	16.66	..	25.00	Arrested,	2 = 16.66% of 12
Number of Patients.	2	..	4	..	6	..	..	..	..	..	1	1	1	..	3	1	1	1	..	3	Improved,	6 = 50.00% of 12
																					Unimproved,	0

Moderately Advanced Cases, 27 = 36 Per Cent. of 75

Condition on Oct. 31, 1911	Health Satisfactory					Health Unsatisfactory					Status Doubtful					Dead					Totals	
Condition on Discharge	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	Apparently Cured,	8 = 29.62% of 27
	50.00	33.33	..	..	29.62	12.50	16.66	..	..	11.11	25.00	..	..	33.33	11.11	12.50	50.00	100.00	66.66	48.14	Arrested,	12 = 44.44% of 27
Number of Patients.	4	4	..	..	8	1	2	..	..	3	2	..	..	1	3	1	6	4	2	13	Improved,	4 = 14.81% of 27
																					Unimproved,	3 = 11.11% of 27

Far-advanced Cases, 36 = 48 Per Cent. of 75

Condition on Oct. 31, 1911	Health Satisfactory					Health Unsatisfactory					Status Doubtful					Dead					Totals	
Condition on Discharge	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	C.	A.	I.	U.	Total	Apparently Cured,	2 = 5.55% of 36
	50.00	14.28	23.52	..	16.66	..	14.28	..	..	2.77	..	..	..	10.00	2.77	50.00	71.42	76.47	90.00	77.78	Arrested,	7 = 19.44% of 36
Number of Patients.	1	1	4	..	6	..	1	..	..	1	..	..	..	1	1	1	5	13	9	28	Improved,	17 = 47.22% of 36
Totals	50.00	23.80	29.62	..	26.66	7.14	14.28	..	..	5.33	21.42	4.67	3.70	15.38	9.33	21.42	57.14	66.66	84.61	58.66	Unimproved,	10 = 27.77% of 36
	7	5	8	..	20	1	3	..	..	4	3	1	1	2	7	3	12	18	11	44		

Total Apparently Cured, 14 = 18.66% of 75. Total Arrested, 21 = 28% of 75. Total Improved, 27 = 36% of 75. Total Unimproved, 13 = 17.33% of 75.

condition of health; 1, or 2.77 per cent., is in an unsatisfactory condition of health; the status of 1, or 2.77 per cent., is doubtful, and 28, or 77.78 per cent., are dead.

Two, or 5.55 per cent., of these far-advanced cases were discharged apparently cured. Of these apparently cured patients, 1, or 50 per cent., is in a satisfactory condition of health, and 1, or 50 per cent., is dead.

Seven, or 19.44 per cent., of these far-advanced cases were discharged arrested. Of these arrested patients, 1, or 14.28 per cent., is in a satisfactory condition of health; 1, or 14.28 per cent., is in an unsatisfactory condition of health, and 5, or 71.42 per cent., are dead.

Seventeen, or 47.22 per cent., of these far-advanced cases were discharged improved. Of these improved patients, 4, or 23.52 per cent., are in a satisfactory condition of health, and 13, or 76.47 per cent., are dead.

Ten, or 27.77 per cent., of these far-advanced cases were discharged unimproved. Of these unimproved patients, the status of 1, or 10 per cent., is doubtful, and 9, or 90 per cent., are dead.

All Classes Combined

Of all classes combined, 20, or 26.66 per cent., are in a satisfactory condition of health; 4, or 5.33 per cent., are in an unsatisfactory condition of health; the status of 7, or 9.33 per cent., is doubtful, and 44, or 58.66 per cent., are dead.

Fourteen, or 18.66 per cent., of these combined classes were discharged apparently cured. Of these apparently cured patients, 7, or 50 per cent., are in a satisfactory condition of health; 1, or 7.14 per cent., is in an unsatisfactory condition of health; the status of 3, or 21.42 per cent., is doubtful, and 3, or 21.42 per cent., are dead.

Twenty-one, or 28 per cent., of these combined classes were discharged arrested. Of these arrested patients, 5, or 23.80 per cent., are in a satisfactory condition of health; 3, or 14.28 per cent., are in an unsatisfactory condition of health; the status of 1, or 4.76 per cent., is doubtful, and 12, or 57.14 per cent., are dead.

Twenty-seven, or 36 per cent., of the combined classes were discharged improved. Of these improved patients, 8, or 29.62 per cent., are in a satisfactory condition of health; the status of 1, or 3.70 per cent., is doubtful, and 18, or 66.66 per cent., are dead.

Thirteen, or 17.33 per cent., of these combined classes were discharged unimproved. Of these unimproved patients, the status of 2, or 15.38 per cent., is doubtful, and 11, or 84.61 per cent., are dead.

The foregoing analyses and charts are self-explanatory and require little comment. It has already been explained that a more exhaustive analysis of such limited material would be of little additional value in this inquiry. Even a yearly mortality curve in the different groups, some of which com-

prise so very few cases, would be of little additional advantage. In the larger investigation now in process such curves will, of course, be plotted.

CONCLUSIONS

1. Among the patients included in this inquiry more women than men, in all groups, have survived from six to nine years subsequent to treatment.

2. Among the "Apparent Cures" in the various groups as classified upon admission, it is somewhat remarkable that the percentage surviving among the "Far Advanced" group is in every case considerably larger than in either of the other two groups, but, of course, the number of such cases is very small.

3. The percentage of deaths after from six to nine years subsequent to discharge in the various groups as classified upon admission show the natural prognostic advantage in favor of the earlier cases; thus, in the "Incipient" class 19.23 per cent. died, in the "Moderately Advanced" class 45.97 per cent. died, and in the "Far-advanced" class 82.03 per cent. died.

4. In the present inquiry the prognostic advantage is shown to have been in favor of such groups as have enjoyed the better economic conditions after discharge.

I wish especially to thank the chairman of this section, Mr. Frederick L. Hoffman, Statistician of the Prudential Life Insurance Company, for invaluable suggestions and assistance in this statistical inquiry.

EMPLOYMENT OF PATIENTS AFTER LEAVING SANATORIA

By W. J. Vogeler, M.D.
Yonkers, N. Y.

Since time immemorial, the question of the relation of employment to tuberculosis has been an all-important one, and all articles of any importance referring to etiology have dwelt much on those forms of employment which are harmful to those predisposed. It is a remarkable fact, therefore, that although prisons, reform schools, insane asylums, and institutions for epileptics and feeble-minded have some time since taken up the question of employment of patients, it is only in late years that the question of employment of the tuberculous patient, while in the institution, as well as after discharge, has assumed much importance. In all probability the agitation of this question is due to the development of large sanatoria, and unfortunately, in most cases, it has proved itself a difficult one to solve.

As Dr. Lawrason Brown has said, for the well-to-do the problem is easily solved; for the working-man, especially the skilled workman, trained to but one small part of a trade, the problem of proper work is oftentimes more serious than that of recovery.

Nothing is more remarkable than the complete change of thought regarding the occupation of patients after discharge, which has developed within a comparatively short period. It is not long since that all advice to arrested cases, especially that given by the family physician, has followed one chief line, namely, work out-of-doors. Even within the last few years a well-known writer, in his article, deplored the fact that the outlook for one of his patients was hopeless because he would have to return to his work indoors in the factory.

At the Sixth Annual Meeting of the National Association, in 1910, Dr. A. M. Forster read an admirable paper favoring the farm colony as a possible solution of the question of employment of patients after discharge. He pointed out that at discharge the patient was suddenly released from rigid

discipline and supervision, and although he was kept track of through the dispensary, he must fight his battle practically unaided. He makes the statement that it cannot be denied that agriculture offers the best form of employment, being a form of occupation offering sufficient variety of exertion, and at the same time giving one an opportunity to keep control of the patient. We, however, do not agree with Dr. Forster when he states that a patient who has developed tuberculosis is unsuited for city life. A number of arguments can be stated against his farm colony idea, for instance:

(1) City patients can with difficulty be interested in farm work.
(2) Lack of amusement during the hour of recreation would be a drawback.
(3) In summer the enervating heat would prove a serious drawback.
(4) It is wrong economically.

Dr. Cullen, in discussing Dr. Forster's paper, made the following statement: "There is just one point in connection with patients working on a farm that I would like to mention here, and that is the fear of the general public of the consumptive—a fact that must always be taken into account. If the general public knew that these tuberculous people were picking berries and raising lettuce and other vegetables, and this produce was being sold, I fear that there would be great difficulty in obtaining a sale."

Lyman sums up the matter very well in his article when he says: "Farming means a life of long hours where severe physical strain is at times unavoidable; a life of more or less exposure to all the changes of the weather; and unless he has been brought up on a farm and thoroughly understands it, often financial failure. It is true that in many sanatoria the patients work on the farm, and not only without injury but with positive benefit. Here, however, the work is done, not to make a living, but as a part of the treatment, and under close medical supervision; here the hours of labor can be regulated entirely with reference to the physical condition of the patient."

In concluding the discussion of his paper, Dr. Forster himself agreed that the farm colony takes the place in our organization of caring for those cases which cannot be provided for in any other way, and not as a means of livelihood. As it is apparent from this that the farm colony does not solve the problem, we must look to something else, and it has gradually become apparent also that simply telling a man to obtain outdoor employment does not solve the problem.

As Dr. Lyman of Wallingford has said: "After discharge the patient is, to a large extent, thrown upon his own resources. His disease is under control, but it will be two or three years, if not more, before he can regard himself as well, and in the meanwhile he not only has to rely chiefly on his own judgment concerning his case, but has the problem of his own support and often that of his family confronting him. What shall he do? What type of work can he take up that will pay him a living wage, and at the same time not jeopardize his ultimate chance of cure?

"So far, advice to arrested cases, and especially that given by the family physicians, has followed one chief line—work out-of-doors. To get a light job out-of-doors has a very attractive sound, but it is advice which is often not easy to follow, and if such work be available it is not only unnecessary but sometimes even injurious. If a man can afford to put in a year or more at employment which will enable him barely or partly to meet his expenses, and can secure employment which will keep him in the fresh air, and at the same time free from danger of over-exercise, then there can be no question as to this offering him the surest means of regaining his health. But occupations of this type are few and most difficult to secure, and the problem is in many ways further complicated by the necessity of supporting others dependent upon him.

"Let us consider briefly the outdoor work which is available. There are a few positions, such as watchman, gateman at a factory, flagman at a crossing, or ticket-chopper on the elevated roads where one is free from exposure or physical strain and can sit down quite a large proportion of his time. This work is ideal; its one objection besides the scarcity being that the pay is as light as the work. Driving livery teams sounds attractive, but it means exposure at times which may be severe and prolonged; and at times, also, leads to severe strain. Some take jobs at driving delivery wagons and are again subjected to strain and exposure. A man must be out in all weather, in and out of his wagon, carrying parcels up and down stairs, constantly on the move with but little real rest. Collecting insurance is better, because in many cases a man can arrange the hours in accordance with his feelings; but here again there is much walking, many stairs, and, at the same time, exposure. Supervising construction gangs is not bad, as the work is not done in very bad weather; there is no physical strain and a man has a chance to sit down and rest. The trolleys attract many, but the man must be in good condition to hold out until he gets a regular run. The hours at the start are sixteen a day and the meals are very irregular. The conductor's work exposes him either to rain or to dust; he must be

constantly on the move and the work is nervous work. The motorman has the best of it on the suburban runs where he is provided with a stool. In town, where he is compelled to stand all the time, the work is decidedly arduous."

In order to solve the problem of tuberculosis among the working class in Yonkers, a factory town of approximately 80,000 people, of which 30,000 are dependent upon the factory and shops for a living, Sprain Ridge Sanatorium was opened in April, 1908. It was the original intention of the founders that as the patients advanced toward recovery they should be allowed to return to their usual work, returning to the sanatorium at night and on Sundays, so as to be kept under observation until their health had become completely restored. This, however, was found to be impossible in many cases, because the authorities in the factories and shops would not take on any employees except upon full time. Another plan was substituted, therefore, which allowed the patients to remain at the sanatorium for the regular period of six months, getting them gradually upon graduated exercise and then returning them to the factories and shops upon full time.

We then endeavored to investigate in all cases the question of the best form of occupation for the patient in whom the disease has been arrested. From the fact that all patients from Sprain Ridge are from the city of Yonkers, and upon discharge return to work in this city and are called upon to report on their condition of health at stated intervals, we have had an exceptional opportunity to follow out such investigations. While with such a small number of cases it is impossible to formulate any positive law, we soon found that certain out-of-door occupations, such as motorman, conductor on trolley cars, caddy, driver, etc., which would ordinarily be considered beneficial, have, from the long hours, irregular employment, and mental strain, proved the reverse. We at first thought that those who had returned to work in the factories and shops had done much better, attributing this to the better hygienic surroundings provided by their employers. As our investigations progressed we changed our minds somewhat, and came to the conclusion that, in general, those who had returned to their old occupations had done the best of all, for the following reasons: (1) From their knowledge of the work they can command a higher proportion of wages, and thus are in a better position to obtain proper food and home comforts and hygienic surroundings. (2) They are freed from the nervous strain and worry incident to the learning of a new trade. Approximately, 60 per cent. of our discharged patients have returned to their old employment.

We soon learned that the only way to attain good results in the treatment of our tuberculous patients was to follow up the case after discharge, and that this is impossible unless the method is more or less voluntary and also systematic. In order to do this, we formed a club composed of our discharged patients, called the "Sprain Ridge Club." This club meets the last Sunday of each month. The object of the club is to encourage the patients to meet socially, and to discuss all subjects bearing upon the care of the disease, and receive advice and instruction from the attending physician and superintendent. We have found this club of the greatest assistance and have been somewhat surprised at the regularity of attendance and the great interest shown. Although it is impossible for every patient to return to us each month, we found this to be a distinct advantage, as the time will not permit us to see more than fifteen to twenty at one meeting and do justice to each one. It has proved a successful method of interesting the patients in the study of their condition and an encouragement to pursue proper methods of living. In this way we have kept in touch with all the patients individually. Each member is notified by postal card a week before the expected meeting.

Yonkers, N. Y.,.....191...

The Sprain Ridge Club will meet Sunday.....
at 3 p. m.

HELEN SMITH, Superintendent

Form of Meeting Announcement

With a view to greater accuracy in the reports of patients, a blank has been devised and is filled out by the nurse at each meeting.

Sprain Ridge Club

Name.....Date of Discharge.....

No.....Weight on Discharge.....

DATE	OCCUPATION	WEIGHT	TEMP.	PULSE	RESP.	COUGH	SPUTUM

Form of Blank Filled Out at Meeting

To those who do not present themselves at each meeting, a return postal card is mailed.

Sprain Ridge Club

You have not been present at any meeting of the Club for four months. Will you therefore kindly fill out the attached card and mail to Sprain Ridge Hospital?

Sincerely yours,

Date.....

Sprain Ridge Club

Date.....

Name.....

Address.....

Occupation.....Weight.....

Cough.....Expectoration.....

Condition.....

Form of Return Card

As a result of our studies we have come to the conclusion that it is best for the discharged patient to return to his former occupation unless this be absolutely injurious, and should he not have been engaged in any occupation previous to his admission to the sanatorium, we have advised him to take one up, believing that some form of occupation under the right conditions is the prime requisite of health. Other desirable things are also of importance. The personal hygiene of the workman, his freedom from the effects of alcoholism and of fatigue caused by improper feeding, excesses, and loss of sleep contribute directly to his assurance of health and freedom from possible relapse. The work to which a discharged patient returns after leaving the sanatorium is with certain exceptions quite immaterial as regards indoor or outdoor occupations, so long as it is commensurate with his strength. Agreeing with Dr. Lyman, we have worked on a theory that it has usually been the fourteen hours away from the job rather than the ten hours on it which have contributed most to the patient's breakdown. Under home conditions, where a patient can sleep out-of-doors or in a well-

ventilated room and can take the needed rest-cure after his work is over, we feel that he would be in less danger of relapse at his own former work indoors.

Since the subject of this paper was announced I have received a number of inquiries in regard to proper forms of occupation, and have been asked whether certain forms of employment, such as undertaker, tailor, etc., were harmful or not. It has seemed advisable, therefore, to include in this paper a list of occupations. These have been taken from tabulated lists of occupations of cases of tuberculosis in the Phipps Institute, from a list mentioned by Brown, and from several others. To these have been added a number of occupations occurring among our cases, not mentioned elsewhere. It is needless to say that many occupations will be found missing in this list, but it has seemed preferable to include only those occupations occurring among cases of tuberculosis treated in sanatoria, dispensaries, etc., rather than to compile a list taken from government statistics.

This table has been divided into two main groups—(1) healthy, and (2) unhealthy. Those in the first group have again been subdivided into those that are undoubtedly healthy, and into those to which some exception might be taken and which are open to discussion. The second group we have divided into (A) those that are harmful because of the occupation, (B) those that are harmful because of factors connected with that occupation, and (C) those that are harmful because of danger to employer or to the consumer of his products.

The main object in compiling this list is to invite discussion. In all probability there will be many who disagree with me and would put certain occupations in another column.

OCCUPATIONS FOR ARRESTED CASES OF TUBERCULOSIS

Healthy		Unhealthy		
Healthy	Comparatively Healthy	A Because of Occupation	B Factors Connected with Occupation	C To Employer, etc.
Artificial flower maker	Attendant in insane asylum	Brakeman	Brewery hand	Child's nurse
Banker	Bowling-alley attendant	Bridge builder	Dyer	Baker
Barber	Boxmaker	Caisson worker	Emery-wheel worker	Hairdresser
Bone-carver	Braider	Canvasser	Garage	Fish cleaner
Bookbinder	Brass worker	Car conductor	Gasworks employee	Grocer
Bookkeeper	Bricklayer	Cigarmaker	Glassblower employee	Ice-cream vender
Bootblack	Brickmaker	Coalyard employee		Iceman
Broker		Collector		Ice manufacturer
				Milkman

OCCUPATIONS FOR ARRESTED CASES OF TUBERCULOSIS—(*Continued*)

HEALTHY		UNHEALTHY		
Healthy	Comparatively Healthy	A Because of Occupation	B Factors Connected with Occupation	C To Employer, etc.
Broom-maker (broom and brush maker)	Cap maker	Constable	Laboratory employee	Nurse
Business man (merchant and dealer, retail and wholesale)	Carpenter	Courier	Marble worker	Midwife
Butler	Carriage maker	Driver	Stone-cutter	Oysterman
Buttonhole maker	Cementer	Drayman	Miner	Seamstress
Cabinet-maker	Chemist	Horseman	Pool-room attendant	Butcher
Chair-caner	Electrical worker	Teamster	Printer	Candymaker
Chambermaid	Elevator employee	Engineer	Rag-sorter	Cook
Clergyman	Fireman (fireman and engineer)	Expressman	Reporter	Druggist
Clerk (clerk and copyist)	Gasfitter	Farmer	Riveter	Spice-room worker
Cloth examiner	Glazier	Hostler	Sailor	Nurses (trained)
Cooper	Gold preparer	Huckster	Scissors-grinder	
Coppersmith (copper worker)	Harness maker (saddle maker and repairer)	Inspector	Stage hand	
Cutter	Houseworker	Iron worker	Stone-cutter	
Decorator	Lamp cleaner	Janitor	Type-polisher	
Designer (architect, designer, and draughtsman)	Laundry worker (male and female)	Junk dealer	Typesetter	
Dressmaker	Masseur	Letter carrier	Woolsorter	
Engraver	Mechanic	Lineman	Wine dealer	
Embroiderer	Mill hand	Longshoreman	Detective	
Factory hand	Molder	Lumber-yard employee	Hotel and boarding-house keepers	
Foreman (mill)	Oilworks employee	Messenger boy	Saloon and restaurant keepers	
Gardener	Operator	Motorman	Livery stable keepers	
Hatter (hat and capmaker)	Packer	Mover	Tobacco workers	
Jeweler	Paperhanger	Musician		
Labeler	Penmaker	Navy employee		
Labor boss	Pipe-cutter	Newspaper vender		
Laborer (labor not specified)	Plasterer	Painter		
Lawyer	Plaster-of-Paris worker	Peddler		
Leather worker (currier and tanner)	Rubber-maker	Plumber		
Librarian	Sawyer	Policeman		
Lithographer	Seamstress	Watchman		
Locksmith	Statue-painter	Porter		
Machinist	Steamfitter	Rigger		
Merchants and dealers	Stereotyper	Salesman		
Metal worker	Terra-cotta worker	Saleswoman		
Milliner	Tin-roofer	Scrubber		
	Trunkmaker	Shipper		
	Waiter	Shipwright		
	Washerwoman	Signalman		
	Wheelwright	Soldier		
	Chicken-farming	Steel worker		
		Stevedore		
		Stoker		
		Street-cleaner		
		Street-paver		
		Tool-sharpener		
		Undertaker		
		Veterinarian		
		Window-cleaner		
		Wood-chopper		

OCCUPATIONS FOR ARRESTED CASES OF TUBERCULOSIS—(*Continued*)

HEALTHY		UNHEALTHY		
Healthy	Comparatively Healthy	A Because of Occupation	B Factors Connected with Occupation	C To Employer, etc.
Morocco finisher		Lumberman		
Nickel-plater		Raftsman		
Office-boy		Miller		
Officials of company		Auctioneer		
Oilcloth worker		Vine-grower		
Optician		Compositor		
Photographer		Pressman		
Physicians and surgeons		Newspaper work		
Picture-frame maker				
Presser				
Servant				
School-child				
Shirtmaker (shirt and collar and cuff maker)				
Shoemaker				
Springmaker				
Stand-keeper				
Stenographer (stenographer and typewriter)				
Storekeeper's employee				
Student				
Suspender maker				
Tailor				
Teacher (teacher and professor in college)				
Telegraph operator (telephone and telegraph)				
Telephone operator (telegraph and telephone)				
Time-keeper				
Tin-plater (tinplate and tinware worker)				
Tinsmith				
Truss-maker				
Upholsterer				
Violin-maker				
Watchmaker				
Weaver				
Woodworker				
Wrapper				

In concluding this article, I cannot lay too much stress on the fact that success in this, as in all systems of the kind, must depend not merely on careful choice of occupation, but on the intelligent application of this to individuals. It is not possible to embody in an article any form of occupation that will universally prove beneficial. The following is a summary of our conclusions:

1. Outdoor employment is not necessary.

2. Farm colony idea is impractical.

3. Return to former occupation is advisable unless this occupation is undoubtedly harmful.

4. Even though the former occupation be indoors, we feel that the patient would be in less danger of relapse at his own work because: (*a*) Exposure is less; (*b*) the physical strain is less, and the opportunity for sitting down to work greater; (*c*) the pay is much better, and the patient and his family can live better; (*d*) the work is familiar and requires less energy, both physical and mental; (*e*) the patient is usually working for, and with, those interested in him who will help him in any way they can.

A REVISED ESTIMATE OF THE ECONOMIC COST OF TUBERCULOSIS

By Irving Fisher, Ph.D.
New Haven, Conn.

The object of this paper is to revise the estimates in a former paper read before the International Congress on Tuberculosis in October, 1908, on "Costs of Tuberculosis in the United States and Their Reduction," and to add certain data on the cost of the campaign and the returns on the investment. These estimates relate to the total number of deaths in the United States and the monetary losses entailed by these deaths and by the illnesses which precede them. In the present paper, as in the former, the object is not to ascertain exact or even probable costs, but merely *safe minima*. The data are far too imperfect to afford a basis for exact estimates. Moreover, the results are so startling that only the safest possible minimum estimates can have any practical value in awakening the public conscience to the magnitude of the Great White Plague.

In the present paper it is estimated that at least 155,000 deaths from tuberculosis (all forms) occur annually in the United States. A minimum estimate of the monetary losses which these deaths represent is as follows:

Loss to the patients themselves		$665,000,000
By sickness	$145,000,000	
By death	520,000,000	
Loss to others		570,000,000
By sickness	$220,000,000	
By death	350,000,000	
Total		$1,235,000,000

When the present paper was undertaken I had thought to make a complete revision of the estimates of 1908 in the light of further investigations and data. In particular I had hoped to utilize the Census figures for 1911 and to make use of the method proposed by Professor Glover of the University of Michigan, which is by far the best, although also the most laborious. In both cases, however, I have been disappointed. As the Census

figures for 1911 are not yet complete, I have been forced to make use of less perfect data than will be available in a few months. My thanks are due to Dr. Cressy L. Wilbur, of the Census Office, for his kindness in supplying me in advance of publication with such unpublished material as is now available. I was also disappointed to find, on examining the elaborate tables prepared by Dr. Glover, that, although his method is exact, he has applied it to very inexact statistics. He has used* the number of deaths for the whole United States as reported by the Census Enumerators in 1900 instead of the more exact figures recorded continuously in the "Registration Area." As Professor Willcox points out,† "the most serious flaw" in Professor Glover's work "is found in his hasty acceptance of the deaths recorded in the Twelfth Census for the entire country as a basis for his computations."

Under these circumstances it seemed to me best to confine this paper to a mere memorandum, revising the results of the former figures merely so far as the number of deaths in the United States is concerned. I much hope that within another year, when the new Census figures are available, and when we shall have the best available data on the subject, Professor Glover will recalculate the cost of tuberculosis, using the best data then available and the best method, which is his own.

I shall now describe briefly the process by which the estimates above presented were reached. As to the number of deaths from tuberculosis, in the United States, we now have, as compared with 1908, a greatly increased registration area, and we may now safely add very considerably to the number of deaths (138,000) which I ventured, with perhaps undue caution, to claim as a safe minimum in 1908. The increase in the estimate of 1912 over that of 1908 does not, of course, indicate any actual increase in the number of deaths, but only a somewhat larger and better basis for calculation. In 1908 only 41,000,000 of the population were included in the registration area, while the registration area of 1911 included nearly 54,000,000. I have also been enabled to include Kentucky, which is to be admitted to the registration area next year, and the health officer of which has kindly supplied me with the number of deaths (5200) from tuberculosis reported in 1911. In this way we have a record of the actual number of deaths for 56,000,000 of population, or over 60 per cent. of the total population (91,500,000) of the United States. For the remaining 40 per cent. an estimate had to be made

* "The Monetary Loss in the United States due to Tuberculosis, Based on the Returns of the Twelfth Census of the United States," by James W. Glover. Reprinted from the "Transactions of the Sixth International Congress on Tuberculosis," 1908.

† "Special Report on Vital Statistics," by Professor Walter F. Willcox, Consulting Statistician, State of New York, State Department of Health, August, 1910.

based on the urban and rural populations cross-classified into white and colored.* This method of estimation, when tested for Kentucky by the actual number of deaths from tuberculosis reported, gives only four-fifths of the actual number, so that it is not unlikely that the total number of deaths in the registration area is 25 per cent. greater than here estimated, and there are various reasons which might be given for believing it to be greater still. If I were allowed to hazard a guess as to the probable number of deaths in the United States from tuberculosis in 1911, I should place it at about 180,000, and should feel safe only in saying that it does not exceed 220,000, which would be the figure reached on the assumption that the death-rate in the unrecorded portion of the population was as great as the death-rate among the colored in the registration area. At any rate, I believe no one will dispute that the figure, 155,000, is a safe minimum.†

The figure used in 1908, namely, 138,000, was intentionally ultra-conservative because of the scantiness of the data at that time, and is the smallest estimate of all those that were made in that year, the highest being that prepared for and published under the name of President Roosevelt, namely, 200,000.

The other data, on the basis of which the calculations for 1912 have been made in this paper, are the same as those used in the paper written in 1908. In most cases it would have been permissible, I think, to have slightly raised these estimates also. I content myself, however, with merely giving evidence that the original data are conservative.

In the first place, the estimate for 1908 is conservative as compared with the estimates which were made by others for that year. The various estimates of the cost of tuberculosis all agree approximately when due allowance is made for the different kinds of costs included in the different estimates. This agreement may not be evident at first, for the figures taken as published, without any explanations, show apparent discrepancies.

* It is for this cross-classification in particular that the exact Census data are not available yet.

† The totals of the calculation for the minimum number of deaths from tuberculosis (all forms) in the United States are as follows:

			Population	Death-rate (per 100,000)	No. of Deaths
Registration area			53,800,000	160.3	86,300
Kentucky			2,300,000	224.5	5,200
Non-registration area (exclusive of Kentucky) (*Estimates*)	Rural	White	26,900,000		32,800
		Colored	6,700,000		23,300
	Urban	White	2,400,000		4,000
		Colored	600,000		2,900
					154,500

The following table gives these estimates:

Fisher	$1,100,000,000
Willcox	650,000,000
McSweeney*	620,000,000
Hoffman†	240,000,000
Glover	42,000,000

The discrepancies between these various estimates are, as Professor Willcox has shown, largely due to differences in the objects aimed at by the various estimators and differences in the assumed bases on which the calculations are made. My estimate of $1,100,000,000 appears to be the highest, but, unlike the other estimates, it includes the costs to the consumptive himself of the earnings cut off by sickness and death. The part of this which is exclusive of all costs to the patients themselves was estimated by me at a minimum of $440,000,000. Professor Glover's estimate appears to be the lowest. But he confined his estimates to males, and assumed that each male worker between the ages of twenty and seventy earns on the average a surplus of only one hundred dollars. Professor Glover's assumption of $100 is evidently not a statistical estimate, but simply a "unit datum" taken for convenience in the absence of any accurate figure and to be multiplied by the exact number of hundreds of dollars when ascertained. As he states: "It becomes merely a problem of multiplication to determine the loss sustained . . . when the actual annual wealth-producing capacity per individual has been exactly determined."‡ When these differences in assumed bases are removed and other changes are made, Glover's method leads, as Professor Willcox§ shows, to $460,000,000, a result almost identical with mine. Thus the apparently highest estimate and the apparently

* The figure given is $622,513,904. "Tuberculosis as a Factor in the Increased Cost of Living," by Edward F. McSweeney. "The Transactions of the Seventh Annual Meeting of the National Association for the Study and Prevention of Tuberculosis," June, 1911.

† "Maryland Medical Journal," February, 1904.

‡ "The Monetary Loss in the United States Due to Tuberculosis, Based on the Returns of the Twelfth Census of the United States," by James W. Glover. Reprinted from the "Transactions of the Sixth International Congress on Tuberculosis," 1908.

§ The computations of Professor Glover, as revised by Professor Willcox, are as follows:

Original computation	$42,000,000
After correcting for imperfection of record in non-registration area	79,000,000
After using $300 as the annual surplus earned in place of $100 employed by Professor Glover	240,000,000
After increasing 14 per cent. to allow for deaths below twenty and above sixty	270,000,000
After increasing by 42 per cent. to allow for deaths among women	383,000,000
After allowing for reduction of earnings and increased cost of maintenance during illness	460,000,000

lowest estimate are in substantial agreement. Professor Willcox's own estimate differs from those of others by including the costs of bovine tuberculosis. Omitting this item and making another revision which Professor Willcox afterward suggested, allowing greater cost of woman's maintenance than in his original estimate, his figure becomes $550,000,000.* The estimate of Dr. Hoffman is based on the assumption that the consumptive's death represents a loss of $50 a year for each of 32 years after he dies. This is a much smaller figure for annual loss than usually given and is, as I understand Dr. Hoffman, not put forward by him as an estimate but as an ultra-safe minimum. Nor does it take account of illness before death. On the other hand, it does not take account of the diminution of these figures through the process of discounting to translate them into present values at the times the deaths occur. Since Dr. Hoffman's estimate is based on 150,000 deaths per annum, due consideration for the differences in method would bring it into agreement with the other estimates, just as Glover's estimate was brought into agreement by Professor Willcox. The other estimates (Willcox, $535,000,000, and McSweeney, $620,000,000) exceed mine of 1908 ($440,000,000), while mine of 1912 ($570,000,000) falls between.

I believe that all the estimates are safely within the truth. My own of 1908 was especially low because of the small estimate (138,000) of the number of deaths. The other data for the calculation are also conservative. These are as follows:

1. The mean after-life of the *average* person living at the ages at which consumptives die is taken as 32 years.

2. The mean after-life which the *consumptives* would have had, had they not fallen into the clutches of tuberculosis, is taken as three-fourths of that of the average person, or 24 years.

3. The productive period of life is taken as between 17½ and 60 years of age.

4. The part of the consumptive's lost "mean after-life" (24 years) which would have fallen within the above productive period is 17 years.

5. The period of total disability preceding death, during which period the patient earns nothing toward his own support, is taken as 1½ years.

6. Preceding total disability, the period of partial disability, during which he is supposed to earn half his former earnings, is also taken as 1½ years.

7. The average earnings of all workers in the United States, including working children and working housewives (their work, though not rewarded

* "The Economic Loss to New York State in 1907 from Tuberculosis," by Professor Walter F. Willcox, "Transactions of the Sixth International Congress on Tuberculosis," vol. iii, p. 37. See also his later article, "Special Report on Vital Statistics."

by money, being appraised in money), is taken as $700 per annum. This includes wages, salaries, and profits in business and in the professions.

8. The average cost of supporting and caring for the consumptive during the period of total disability is taken as $1.50 a day.

9. The ratio of actual workers to those of working age is taken as three-fourths.

10. The workers, including working housewives, are supposed to constitute 45 per cent. of the population.

11. These workers are supposed to consume 60 per cent. of their own earnings, and their dependents the remaining 40 per cent.

The manner in which these data are used in the computation is fully explained in my paper of four years ago. In brief it is as follows: The average earnings of $700 per year for 17 working years in the future are discounted at 5 per cent. and thus converted into present value. Forty per cent. of this gives the loss to others from the consumptive's death. This is added to the loss of $700 earnings per year for 1½ years preceding death, plus half that amount for the preceding 1½ years of partial disability and $1.50 a day for the cost of support during the period of total disability. The total is then multiplied by the number of deaths per annum. This method is similar to that employed by Professor Willcox and most of the other writers.* We are to show that in the light of the most recent information these various data are conservative.

1. Taking these up in order, we note first that the mean after-life (32 years) which consumptives would lose if they had average vitality is deduced from the Life Table of Abbott for Massachusetts,† based on the mortality of 1893–97. Unfortunately, we have no exact statistics for the country as a whole, but some recent statistics‡ of Dr. Price, Secretary of the Maryland Board of Health, show a slightly greater expectation of life or mean after-life in Maryland at the ages at which consumptives die than in Massachusetts.

The American Experience table of the life insurance companies shows practically the same expectation of life at the ages 30 to 40 as the Massachusetts tables. The expectation of life in New York City, on the other hand, according to Roche,§ is about 5 years less than in Massachusetts.

* *Ibid.*

† See the Life Table for Massachusetts in "The Vital Statistics of Massachusetts for 1897," by Samuel W. Abbott, M.D., "Thirtieth Annual Report of the State Board of Health of Massachusetts for 1898."

‡ "The Maryland Biometer and Some of its Mathematical Relations," by Marshall Langton Price, M.D., Baltimore, Md. Reprinted from the "American Journal of Public Hygiene," vol. xix, No. 3, August, 1909.

§ "An Investigation into the Mortality Rates of the City of New York," by John F. Roche. "The Transactions of the Actuarial Society of America," 1903, vol. vii, p. 426.

The mortality of New York City (corrected for age distribution) is higher than the average for the country. Statistics of the census of 1900 show that the rate of mortality of Massachusetts was slightly less than that for the registration area as a whole when corrected for age distribution. This would go to show that the average duration of life in Massachusetts was slightly greater than in the country as a whole. On this basis it is probable that the expectation of life in the United States is about a year less than in Massachusetts, but it is doubtless also true that the expectation today is greater by more than a year than it was when the Massachusetts tables were made. We conclude, therefore, that the expectation of life used is substantially correct.

2. The expectation of life for consumptives was taken as three-fourths of the ordinary expectation of life. This is based on the experience* of the Adirondack Cottage Sanitarium, where the mortality after discharge of patients "apparently cured" indicates a mean after-life of about 16 years, or half the average. The figures of mortality of the Adirondack Cottage Sanitarium correspond to those given recently by Bardswell.† Since it is reasonable to believe that the major part of the abridgment of life of these patients is caused by the disease itself and not by constitutional weakness, it is believed that the estimate of 24 years which splits the difference between the ordinary expectation life and that of those who have once fallen victim to the disease but have been "apparently cured," is conservative. In fact, no other writer on this subject has thought it necessary to allow for constitutional weakness; they have all assumed that the after-life lost through tuberculosis is the same as that which applies to the ordinary life.

3. The period of productivity is taken as lasting from the age of 17½ years to the age of 60. This period is certainly conservative and is shorter than that of most students of this subject, the upper limit being usually taken as 65 and sometimes 70, while the lower limit is sometimes taken as 15.†

4. Of the 24 years of expectation of life cut off by tuberculosis only a part falls within the period of productivity. This part was computed to be 17 years by a process described in my former paper and based on statistics of the age distribution of deaths.

5 and 6. The calculations are based on a period of impaired working power lasting 3 years, following the result of Dr. Price's investigations of

* "The Ultimate Test of the Sanatorium Treatment of Pulmonary Tuberculosis and its Application to the Results Obtained at the Adirondack Cottage Sanitarium," by Lawrason Brown. "Zeitschrift für Tuberkulose," 1908, pp. 205–215.

† "The Expectation of Life of the Consumptive after Sanatorium Treatment," by Noel D. Bardswell.

over 300 cases in Maryland in which the average period is found to be 3 years and 1 month. This is believed to be an exceedingly conservative estimate, especially as the figures relate only to the laboring classes, who do not give up work until absolutely forced to do so. The average would be very considerably increased by the inclusion of the wealthy classes. Of this period of disability a part (a year and a half) is taken, on the basis of Dr. Price's study, as a period of partial disability (Dr. Price finds it to be 1 year and 7 months); and the remaining part (1½ years) is taken as a period of total disability. Even the period of total disability of those forced to betake themselves to institutional care is found by Dr. Biggs in New York to be 270 days and by the experience of the Boston Consumptives' Hospital* to be a year and a half. In the Boston Consumptives' Hospital the average time of complete disability of the 244 who died was 58 weeks, or 1 year and 2 months, and of the 256 living, 89 weeks, or 1 year and 10 months, or an average of complete disability of 1½ years without taking account of the fact that each of the 256 living cases will add something to his period of total disability before he dies. These institutional figures comprise only the period of total disability for people who are forced to accept institutional aid and who are usually forced to omit the period of partial disability altogether. "Only 60, or 13 per cent., of the total number passed through the period of partial working capacity, a fact which is readily explained by the pressure of necessity, which forces the individual to continue at his occupation until completely incapacitated."† It may be assumed that the period of total disability is almost never less than the 1½ years found in the Boston Consumptives' Hospital and in Maryland, and from this minimum it may increase up to several times that period.

By the period of total disability is meant, of course, the period during which the patient gives up work altogether. Evidently, in the case of the well-to-do, total abstention from work may begin even before the disease is far advanced, while among the necessitous it will not begin until the patient is physically incapable of work.

As to the period of partial disability, if the facts could be known exactly, it would doubtless be found that it is far more variable than the period of total disability, there being great differences according to economic condition. The period of partial disability may be anything from

* "An Economic Study of 500 Consumptives Treated in the Boston Consumptives' Hospital," by Edwin A. Locke, M.D., and Cleaveland Floyd, M.D. "Transactions of the Seventh Annual Meeting of the National Association for the Study and Prevention of Tuberculosis," June 20–21, 1911.

† *Ibid.*

zero to 10 or more years. It is zero in the case of the extremely poor (as shown in 87 per cent. of the cases of the Boston Consumptives' Hospital); it is 1½ years for the ordinary wage-earner (as shown by the statistics of Dr. Price for Maryland), and it is a much longer period for the well-to-do.

The assumed periods of partial and total disability are not only in themselves conservative estimates, but they take no account of the preliminary period of impaired efficiency during which the patient's work is only intermittently interrupted or his output slightly reduced in amount or reduced in quality. Mr. Christopher Easton, in his annual report* for the Tuberculosis Infirmary, Blackwell's Island, New York, for 1902, states that the average length of time that the patient had not worked at all before coming to the institution was 2 months and 14 days, and the average period of unsteady employment before stopping work entirely, 3 years and 4 months. In a recent letter to me Mr. Christopher Easton says: "I am absolutely certain that 3½ years is a safe minimum for average duration of illness and hence for combined total and partial disability." Mr. Easton's opinion is based on a study of the New York City Hospital Commission in 1906.

The period of disability, which we assumed was 3 years, does not represent the duration of the disease itself. There is a preliminary period of many years in the gradual oncoming of the disease. To quote Drs. Locke and Floyd:

"The average duration of the disease in the 244 patients who died, as given in Table 1, was approximately 2 years and 1 month, and of the 256 living May 1, 1911, 2 years and 10 months. These averages are somewhat smaller than those ordinarily given. For example, from a study of 1000 cases treated at the Adirondack Cottage Sanitarium, who subsequently died, Baldwin† found that the average duration was as follows: Incipient stage, about 8 years; moderately advanced stage, between 5 and 6 years; far-advanced stage, a little over 4 years. It cannot be questioned that our figures for the duration of the disease as given above are much too small. In our experience, dispensary patients seldom realize that they are sufficiently ill to visit the clinic for examination until the disease is well advanced. This is well illustrated by the fact that in 188 out of the 500 cases the date of onset of the disease was stated by the patient as the same as that of giving up work. Furthermore, unfavorable social conditions, so commonly

* "Report of the New York City Department of Public Charities," 1902, page 157.

† "Modern Medicine," Osler, vol. iii, p. 299.

present in this class of cases, must exert a strong influence in shortening life."*

Corroborative evidence is found in the records of the number of cases of tuberculosis in a community. On June 1, 1911, the Boston Board of Health had on file 7000 cases of tuberculosis.† The record is doubtless incomplete, but these form almost exactly 1 per cent. of the population of Boston. This is regarded by competent observers as a very conservative estimate. Dr. Locke says: "It should further be emphasized that a conservative estimate places the total number of consumptives in Boston at 15,000 as a minimum."‡ In Massachusetts as a whole the Board of Health estimates a ratio of 1 per cent., the same as the 7000 recorded cases in Boston indicate for that city.

Both the city and state estimates are believed to be under-statements. But even on this 1 per cent. basis the total number of consumptives in the United States is estimated at 900,000. If we divide this by the number of deaths estimated in the United States, 155,000, we get nearly six years as the average duration of the disease. Even assuming that the number of deaths annually in the United States is the maximum we have supposed possible, 220,000, the result is over four years. I think it probable that the average duration of the disease may certainly be placed at five or six years without, of course, counting the period of latent tuberculosis which usually, or at any rate often, begins in childhood. It is safe to say that at least a year, and perhaps three years, before the impairment of health becomes pronounced enough to reduce the regular daily wages, there is a preliminary slight impairment of health with occasional interruptions in work from illness, "hard colds," etc. The economic losses which come from being thus "undertoned" include losses of wages, costs of medicines, occasional employment of physicians, etc.

7. One of the data on which the calculations are based is that $700 a year are the average earnings of workers of all kind in the United States. This figure is unfortunately, but necessarily, something of a guess, but it was regarded by Carroll D. Wright as ultra-conservative, he being inclined to the opinion that $1000 would not be an unreasonable estimate. Another statistical expert states that $750 would be an ultra-conservative guess

*Locke and Floyd. (See note, p. 130.)

† Statement of the Boston Board of Health by Edward F. McSweeney, Chairman Board of Trustees of the Boston Consumptives' Hospital, "Tuberculosis as a Factor in the Increased Cost of Living," published in the "Transactions of the Seventh Annual Meeting of The National Association for the Study and Prevention of Tuberculosis," 1911, page 131.

‡ Locke and Floyd. (See note, p. 130.)

based on such data as are available. Professor Scott Nearing, of the University of Pennsylvania, in his book on "Wages in the United States," estimates that the average wages of workingmen are about $600 and of working women about $400. Professor Nearing has, at my suggestion, very kindly consented to supply rough guesses as to salaries and number of salaried persons, on the basis of which I conclude that the average yearly earnings of all *hired* persons, wage-earners and salary earners, men and women, in the United States are about $630. This average must be raised by the inclusion of the earnings of professional and business men who are employed for wages or salaries but who receive "profits." These include lawyers, physicians, and business men. Actual experience among the consumptive poor at the Boston Consumptives' Hospital tends to corroborate these results. The average wages lost per week of the 244 who died and who had been totally incapacitated for 58 weeks was $11.89 per week, and of the 256 living who have been incapacitated 56 weeks it was $11.38 per week.* This means about $600 per year. Only 15.6 per cent. of the patients were without family or dependents. On the basis of all the evidence, which unfortunately is very meager, it is believed that $700 per annum is a conservative estimate of the average earnings of all workers in the United States.

8. One of the data used in the calculation was that, besides the loss of wages during illness, there was a loss in supporting the patient which must be borne by others, and also a loss for expenses of physicians, medicines, nursing, special food, etc., and funeral expenses. It was assumed that these expenses averaged $1.50 a day during the period of total disability. To be conservative no expenses whatever were assumed for the period of partial disability, and to be still more conservative it was assumed that the consumptive during this period of partial disability is not only self-supporting, but that the usual two-fifths of his income are available for the use of others. The assumption of $1.50 per day as the rate of cost of support during the period of total disability was given as the estimate of Dr. Biggs. I am convinced that this estimate is a safe minimum. Even in institutions where large numbers are handled in a wholesale way and at a much smaller cost than at home or in a private institution the cost is seldom less than $1.00 a day. Christopher Easton says that $0.80 per day has been reached by the New York City Department of Public Charities where a large number are treated, and he thinks that $1.00 a day is approximately the average cost for treating charity patients. Mr. Homer Folks finds, on the basis

*Locke and Floyd. (See note, p. 130.)

of experience in New York, that the cost of treating tuberculosis in the institutions was, in 1903, about $1.00 per day for five hundred patients, but that it is more now. In his estimates of costs for the hospitals where small numbers are treated he has been accustomed to name $1.25 per day. Actual experience shows the cost to be $1.30 to $1.40 per day in these institutions. In the Boston Consumptives' Hospital the cost amounts to an average of $1.20 per day. In the Gaylord Farm Sanatorium the average cost is about $1.75 per day. In other sanatoria the cost is about the same and usually larger. In thirty semi-charitable sanatoria scattered throughout the United States it was found by the Executive Secretary of the National Association for the Study and Prevention of Tuberculosis that the average cost of treatment was $1.67 per day per patient. Considering the fact that home treatment is vastly more expensive than institutional treatment, particularly in respect to medical attendance, nursing and special foods, it becomes evident that $1.50 a day is a very low estimate of the financial burden of supporting the helpless consumptive.

9. The estimates are based on the assumption that only three-fourths of those of working age are actually at work. This estimate includes housewives as workers, which I believe is justifiable, not only because they often make money by taking boarders, but because they always save money by saving the necessity of boarding out or of employing housekeepers. They serve as combined cooks, waitresses, nurses and seamstresses for the family. Dr. David R. Lyman, in estimating the earnings of patients discharged from Gaylord Farm Sanatorium, counts the earnings of housewives at $8.00 per week, which is $416 a year. Dr. Lyman's other figures have usually proved to be conservative when tested, but even if this figure be an exaggeration by a hundred dollars, the difference made in the final average would be only $25.00.

10. Counting in the housewives, about 45 per cent. of the population are at work. This is roughly estimated in the previous paper on the basis of statistics of population.

11. But it is assumed that this 45 per cent. of the population consumes 60 per cent. of the earnings, so that only 40 per cent. is lost to others than the victims themselves. This is roughly estimated in the previous paper on the basis of the estimates or expert guesses of the Bureau of Labor as to the relative consuming power of men, women, and children.

Among these numerous rough estimates it is not impossible that some of them may be found in the light of future knowledge to have overstepped the facts; but it is scarcely conceivable that any possible overestimates

can compensate for the fact that the greater number, at any rate, are underestimates.

We conclude, on the basis of the above eleven data and by the method previously described, that each of the 155,000 persons and more who annually die of tuberculosis in the United States cost others at least $1400 *before* death and $2300 *by* death.

Even the institutional cases reveal a surprising total of costs. For example, Locke* says: "The total losses in wages together with the cost of care in public institutions of the five hundred consumptives represent an aggregate of $500,023. Considering the fact that this figure does not include the cost of private or public aid other than hospital care, the numerous expenses incident to illness and death or the potential loss occurring after death, its full significance is apparent." He also says: "The maximum loss is shown in the case of a stone-cutter, who, after a short illness, was obliged to give up his regular work with wages of $25.00 per week. His total loss in the past ten years, therefore, represents a total of $13,000." These figures mean that the average loss in wages and in cost of care in this case, where both the wages and the cost of care are at a minimum, already exceeds $1000 per patient, although the costs are yet incomplete because most of the patients are still living and will continue to be a burden for a long time to come. Nor does this figure include some of the costs before coming to the institution.

If I should attempt to guess as to the degree of overestimates on the basis of the data which I have been describing, I should conclude that the truth was probably 50 per cent. higher than I have given, so that this would make the total loss from tuberculosis to others than the consumptives themselves about $850,000,000. If we include the losses felt by the consumptives themselves before death, the total would be over a billion; while, finally, if we include all costs computed, including even the costs to the consumptives themselves cut off by death, the result is nearly two billions. No account is taken of the cases which recover, although their inclusion would swell our costs many millions of dollars. Until recently they have not been numerous enough in comparison with those who die to be worth counting. The National Association for the Study and Prevention of Tuberculosis, in its last report, records 422 special tuberculosis sanatoria and hospitals in the United States with 26,360 beds which it is known are usually full. Judging from the experience of Gaylord Farm Sanatorium, the total number of patients annually discharged from these sanatoria is about two and a half

* Locke and Floyd. (See note, p. 130.)

times the number of beds, or about 65,000, of which only about 25,000 are "apparently cured," and many of these, we know, ultimately relapse. The average expense per bed per year is doubtless more than $500, and if we suppose that 10,000 of the beds are occupied by persons destined to recover, their cost will aggregate $5,000,000. There are, doubtless, outside of institutions a still larger number of patients. To their costs are to be added the wage losses. But the totals will still be only a small addition to the enormous costs of the great army of patients who march on to death.

Even the cost of tuberculosis to life-insurance companies is enormous. The total losses per annum of seven large companies (Metropolitan, New York Life, New York Mutual Life, Equitable, Prudential, Northwestern Mutual and John Hancock Mutual) as kindly submitted to me by their officials, alone amount to over $11,000,000, constituting in one case as high as 23 per cent. of the total losses.

These cold calculations take no account, of course, of the fact that a man's own life is worth more to him than the earnings he expects it to bring, nor that the loss of monetary support is not the chief loss which widows and orphans suffer from the death of a loved husband and father. No one has yet tried to measure in money the loss of broken hearts, unless the damages which can now be obtained for "breach of promise" or "alienation of a wife's affection" may be called an attempt to do this. But as yet no damages are recoverable for losses to the person himself who loses his life, on the theory that no person is living who can claim this loss. The total of the capitalized loss of earnings to the victims themselves cut off by death stands on a somewhat different basis from the other costs; for not only is this money lost, but the man to enjoy it is lost with it. Because of this peculiarity, if an accident caused death it was formerly true that, in the eye of the law, there were no damages recoverable. It, therefore, cost a railway less to kill a person outright than to maim him. The maimed person had a right to sue, "but if he died, the right to sue died also."* This legal theory has been changed so that the death of a wage-earner gives his dependents the right to sue for the part which they lose by his death. Legal theory still lags behind the facts and there remain many grievous burdens from tuberculosis which we cannot translate into money. For these reasons Professor Willcox and others do not include the losses of future earnings to the decedent. However, even omitting these items, but including the losses the victim suffers as long as he does live and the losses which others

* "Special Report on Vital Statistics," by Professor Walter F. Willcox.

suffer, both before and after his death, we find a total of $570,000,000 + $145,000,000, or $715,000,000 a year.

But in order not to strain our imaginations nor to mix sentiment with ordinary economic losses we may content ourselves by emphasizing the economic tax which tuberculosis levies on the United States, exclusive of the losses to the invalids themselves.

This tax we have found to be at least $570,000,000 per annum. This means that even if we divest ourselves of human sympathy and are absolutely indifferent to the suffering and sacrifice of human life entailed by this greatest of all human scourges, and even if we have no concern to reduce our own chances of succumbing to this disease; if, in other words, we look merely to the losses which we among the well have to bear because others sicken and die of tuberculosis, we still find on this coldest and smallest basis of loss that we are losing more than a half a billion dollars a year. This tax of the consumptives on the other people of the United States is nearly equal to the total taxes of the United States in duties and internal revenue combined.

From a commercial point of view it is not, however, sufficient to show that tuberculosis is a costly disease. Before we can induce the general public to join cordially in the fight against it we must further show that the disease is preventable, and preventable at a cost less than the losses which would be saved by prevention. Experience has shown that one of the most telling arguments before State Legislatures in this commercial country in asking for appropriations is the argument that to fight tuberculosis is an economy to the States as a whole.

Let us look at the facts as presented by one sanatorium. I quote from a paper* of the medical director of this institution, Dr. David R. Lyman.

"The Gaylord Farm Sanatorium was opened September 20, 1904, and on May 1, 1911, the time at which our yearly reports are made, we had 676 discharged cases who had been away from the Sanatorium six months and over. Of these, only 9 were reported as lost, so that we can safely claim a high percentage of accuracy for our records. Thirty-four were school children, and, having no earning capacity as yet, were omitted. This left the 633 cases on the records on which these studies are based.

"In Table I these cases have been classified with regard to condition on admission, and the discharged condition, present health, age, weeks of

* "The Economic Value of the Sanatorium Treatment of Pulmonary Tuberculosis," by Dr. David R. Lyman. "The Transactions of the American Pharmacological Society for 1911."

life, weeks of work, and earnings set forth at length. The table covers 140 Incipient Cases, 373 Moderately Advanced, and 120 Far Advanced. It is of special interest in that it bears out the fact so often insisted upon that the results of treatment are in direct ratio with the stage of the disease at which the diagnosis is made. The Incipient Cases show average total earnings of $1020.60, the Moderately Advanced of $842.22, while the Far Advanced have earned on an average but $192.10. The same ratio holds good in the relation of the "weeks of work" to the "weeks of life" in the several cases. Here the Incipients show a working capacity of 70 per cent. of their total time since discharge; the Moderately Advanced 59 per cent., and the Far Advanced only 23 per cent. The average weekly wages varies but little, being $11.21, $12.03, and $12.00 for the three classes in order as above.

"The permanent investment of that Association in land, buildings and equipment has been $132,292.86, interest on which at 5 per cent. as expended amounts to $30,919.86. If we add to this the $205,824.65 spent in maintenance up to April 30, 1910, *we have a total expenditure of $236,744.51, whereas the amount already earned by discharged patients as shown in the table is $464,406—a return of almost 200 per cent., within six years from the commencement of the work.* These figures take into consideration none of the many indirect financial returns mentioned at the beginning of this paper."

If we add to the wages already earned the present value of the future wages which we may expect them to earn, we find that the result is $796,000 for the 126 incipient cases now living, assuming only half the normal expectation of life, and $925,000 for the 229 moderately advanced cases now living, assuming only one-quarter of the normal expectation of life. Thus without assuming any future earnings by the far-advanced cases, we find a total present value of $1,720,000, which, in addition to the wages already actually earned, makes $2,180,000 as the return in less than six years for the expenditure of $236,744.51. This is, for each $1.00 invested, a return of about $9.00, of which about $4.00 is presumably enjoyed by others than the consumptives themselves. This $4.00 is returned on the wages within six years and on the average in about three years. From the point of view, therefore, of mere commercial gain, the fight against tuberculosis through sanatoria pays a profit by the side of which any ordinary bonanza is a poor investment.

But the possible return is really far greater even than fourfold in three years. This calculation takes no account of what is probably really the most important return from sanatorium treatment, viz., the prevention of tuberculosis in the home and neighborhood of the patient who returns from

his stay at the sanatorium to spread the gospel of fresh air and prevention. A man who had been a patient at Gaylord Farm Sanatorium in 1907, on his return to his home in Waterbury, visited the old concern where he had contracted this disease, a brass mill, and talked to the men in such a way as to reform totally the customs so far as spitting on the floor was concerned. He also changed the habits of living in his own immediate neighborhood. This is typical of what many patients accomplish.

We all know that we get a richer return if we begin earlier than the sanatorium. "An ounce of prevention is worth a pound of cure." What rate of return it would pay the country to provide by registration, isolation, and education of all infectious cases is "simply beyond the dreams of avarice!" No individual philanthropist or group of philanthropists, unless they really love their neighbors as themselves, can be expected to take up these investments on a sufficiently large scale. Last year $15,000,000 were put into the fight, of which $10,000,000 were put in by State and local governments. What is needed is to multiply this sum by 10; then, perhaps, we can in a few years wipe this great scourge off the face of the earth.

THE UNJUSTIFIED PREJUDICE OF TUBERCULOUS PATIENTS AGAINST SANATORIA AND HOSPITALS

By S. Adolphus Knopf, M.D.
New York

Any physician, be he general practitioner or consultant, who has to deal with tuberculous patients and who considers sanatorium treatment to be indicated in many cases, will be confronted frequently, perhaps in the majority of the cases which come under his observation, with a type of fear or preconceived dislike for institutional treatment, which, for lack of a better name, we may call "sanatoriumphobia" or "hospitalphobia."

This fear of institutional treatment amounts, in some individuals, to a veritable horror. The first thought with which this sanatoriumphobic individual is possessed is the idea that he is sure to meet patients much sicker than himself who are real consumptives, while he imagines himself to be only slightly tuberculous. Perhaps it is only in the presence of the physician who diagnosed his case that he is willing even to admit that he may be tuberculous. This peculiar state of mind, which consists in not wishing to be classified with other tuberculous patients or only with those having weak lungs, is pardonable although characteristic.

It seems that a typical tuberculous patient does not like anything better than to find some physician, who, in spite of the positive diagnosis of several others, confirmed by positive sputum tests, will declare that he only has weak lungs. I remember a case referred to me by a most excellent diagnostician for confirmation of diagnosis and advice for treatment. The patient, a few weeks before, had had a profuse hemoptysis. There was not the slightest doubt as to a positive diagnosis. I made arrangements for his reception in a sanatorium, and the young man, who was engaged to be married, promised me faithfully to remain in the sanatorium at least one year, and only to think of marrying after his case should be declared to be absolutely arrested. Imagine my surprise when, two weeks later, the sanatorium physician sent me a letter which the patient had written him

wherein the family physician, another consultant, and myself were denounced in no gentle terms and the arrangements for sanatorium accommodation canceled; and all this because a life insurance examiner had declared the young man sound and well and had accepted him at a very low rate.

When the patient's fear of reinfection has been argued out of him, when he is told that the well-equipped sanatorium is the safest place not to contract the disease, that the precautions there preclude a possibility of becoming reinfected, he will bring forth another excuse for not wanting to go to a sanatorium. He will say that he is unable to bear the sight of other patients more ill than himself; he will fear the depressing influence of constant coughing by others, and perhaps even of seeing a patient hopelessly ill or in a dying condition. When the physician will have assured him that there is less coughing in a sanatorium than there is during a grippe epidemic in any street car of an average-sized city; because in a sanatorium the patient is only allowed to cough when he must expectorate—being taught to control his cough at all other times—which in the end will materially aid to his comfort and recovery; when the prospective candidate for the sanatorium will furthermore have been given the assurance that if there are any patients more ill than he, he will not see them; that the sanatorium has only relatively early cases; that the spirit, that the mental atmosphere of the sanatorium is one of hope, contentment and even gaiety, the prospective sanatorium patient will bring forth a third excuse. He will say, "But, Doctor, I shall be stigmatized. If it becomes known that I am tuberculous and an ex-patient of a sanatorium, I will be ostracized. My former employers will not wish to take me back into their office or shop."

That there is some justification in this excuse for sanatoriumphobia we must admit, for here we approach the subject of phthisiophobia, which, alas! is still rampant in some sections of the country and among some people who have not informed themselves of the fact that the honest, conscientious consumptive, particularly the one trained in the sanatorium, is not a menace to his fellow-men, and that to the arrested or cured case with absolute freedom from bacilli all avenues to work and society should be open.

The object of my paper today, my reason for publishing it, giving it as wide a circulation as possible, and placing it in the hands of sanatorium physicians and others interested in the cause, is to remove the unjustified fear tuberculous patients have of entering a sanatorium. I should like to convince the patient that he need not fear being ostracized if he will but do his duty. I cherish also the hope that this modest effort on my part, and above all the valuable contributions to my plea which have come to me

from leading sanatorium directors, will convince employers and others that phthisiophobia is unjustifiable and that to exclude the cured and thoroughly arrested case from any employment is cruel, unjust, and inhumane.

Last, but not least, I trust that after reading this little contribution, prospective patients will see that their fears of becoming infected or reinfected in a sanatorium are totally unfounded, and that life in a sanatorium is far from depressing; that, on the contrary, an atmosphere of hope, cheer, and good comradeship prevails in sanatoria and that the patients themselves can contribute to this in no small degree by determining to get well, obeying implicitly the rules of the institution, being of a hopeful and cheerful frame of mind, sympathetic and kind to their fellow patients.

To have the statements I am going to make as authoritative as possible, I addressed the following questions to a large number of physicians at the head of American and Canadian sanatoria:

1. Has there ever been an authentic case in your institution of a healthy visitor, employee, physician, nurse, or helper having contracted tuberculosis during his sojourn in the sanatorium, and if so, how many cases have you on record, and covering what period of time?
2. Have you observed among the patients who have come to the sanatorium any who have left the institution shortly after their arrival because they found the association with other patients unpleasant?
3. Do you know of any patients who have suffered from social or business ostracism after having left your sanatorium, either cured or arrested?

With a courtesy characteristic of men working in sanatoria for the tuberculous, they not only sent me answers to all three questions, but many of my friends among the sanatorium directors have added individual expressions of opinion on the subject under consideration which are of incalculable value, because they are based upon actual personal experience, in many instances covering a great many years.

From the oldest and best known institution, founded by our beloved Trudeau twenty-five years ago, Dr. Lawrason Brown, the resident physician, wrote me the following instructive lines: To question No. 1 he answered "No"; to No. 2 he answered "Yes," and added: "We have had a number of patients come to Saranac Lake village, form attachments and then finally on their turn for admission to the institution get very much displeased with the strict discipline to which we subject them at first and leave because they wanted to arrange their life in a way of which we did not approve. Usually after the patients have been here a week they are perfectly willing to stay. It is only at first that the trouble arises." To question No. 3 he answered

"Yes," and added: "There are a number of patients who have suffered from social or business ostracism after having left the sanatorium either cured or improved. We have to take this into consideration in writing to our former patients, and we make it a rule never to write on our letter-heads the name of the institution or the name of Saranac Lake. Several patients have written to us complaining very bitterly that they have lost their places. For this reason we never publish in any paper or in any magazine the name of any patient who has ever been connected with the institution. There is no doubt there is a general feeling against the tuberculous patient, whether well or not, whether careless or careful. I believe, however, that as knowledge spreads, there will be less trouble, but certainly today there is a great deal."

Dr. G. Walter Holden, of the Agnes Memorial Sanatorium at Denver, Colo., answered to question 1, "No"; to question 2, "No"; to question 3, "No," and added: "On the contrary, people owning homes and wishing to take boarders have frequently written or telephoned me that they would be very glad to take patients leaving the sanatorium, as they felt very much safer in so doing than to take health-seekers coming to Colorado and not having had sanatorium training.

"In health communities like Denver certain hotels and boarding-houses advertise that they do not accept tuberculous patients. While this is not always borne out by facts, it has a tendency to make tuberculous people more or less dishonest in denying that they have the disease, knowing that they can obtain admittance to these places by stating they have bronchitis or asthma, if they have any suspicious symptoms at all.

"I am of the opinion that our tuberculosis associations do not go quite far enough in their instructions and statements to the public. A recent example of this that has come to my attention is the case of a young man from New Jersey, who, while an incipient case, was not willing to make the fight to recover his health. The limited statements and injunctions regarding the disease that had come to his notice had made him feel like a leper or outcast. He was swallowing his sputum because he so interpreted a statement on the back of a street-car transfer, to the effect that spitting was prohibited. A great deal of the literature handed out by health organizations has a tendency to make the afflicted feel that they are more or less ostracized, because of the incomplete knowledge gained, and this interpretation is accepted by most of the general public not familiar with the disease. I also think that those of us who are working with tuberculosis all the time are somewhat inclined to overlook the fact that notwithstanding the wide

campaign that is being carried on, the general public is so profoundly ignorant that our technical advice frequently overshoots the mark."

Before going on to the next answer I cannot help saying a word here to emphasize what my friend, Dr. Holden, has said concerning the signs and notices prohibiting spitting. In my experience I have found that a negative command is never as willingly obeyed as a positive instruction. Instead of placarding our public buildings with signs "Don't spit," let us provide a sufficient number of well-kept sputum receptacles with covers, or, better yet, self-flushing elevated spittoons, and over them place a sign reading "Spit here."

Dr. W. Jarvis Barlow, of the Barlow Sanatorium at Los Angeles, Cal., answered to question 1, "No"; to question 2, "No"; to question 3, "No," and added: "We do not know of any case in which a patient after his discharge from the Barlow Sanatorium has suffered any degree of ostracism, either social or business detriment. On the contrary, many instances might be mentioned in which individuals have profited in this respect as a result of previous residence in the sanatorium, *e. g.*, nurses who have been led to the possibility of better employment when they were known to be so-called 'cured cases.' We find that the intelligent public is ready to accept the assurance of physicians that any patient is well and no longer a source of danger to the people about."

Dr. M. J. Brooks, of the Brooks Sanatorium at New Canaan, Conn., answered to question 1, "No," and added: "There certainly cannot be a case here of infection between the patients or any of the staff. The discipline would preclude the very thought of such a proposition." To question 2 he answered "No"; to question 3, "No."

Dr. Jas. D. Brooks, of The Bungalows, San Angelo, Texas, answered to question 1, "No"; to question 2, "No"; to question 3, "No," and added: "To the best of my knowledge there has been no such instance. With respect to San Angelo and the vicinity quite the contrary is true, a patient discharged from the institution being received universally with greater readiness than people suspected of having tuberculosis only."

Dr. Alexius M. Forster, of Cragmor Sanatorium, Colorado Springs, Colo., answered to question 1, "No"; to questions 2 and 3 he answered "Yes," and added: "I feel that the second question, as well as the first, still tends to keep many patients out of institutions. The sanatorium is frequently associated in the patient's mind with the poorhouse or the insane asylum. In the East, in my work with the poorer classes, I frequently had to deal

with an unreasoning fear of all institutions, while out here with the well-to-do I often find that they prefer boarding-house life.

"While the fear of stigma attached to sanatorium life does not altogether account for this attitude, I am sure that it plays quite a part. Some patients often try to keep up the pretense of refusing to admit, even to themselves, that they have tuberculosis, and others, while acknowledging it to themselves, refuse to admit it to others.

"In considering the subject I am sure it has occurred to you that a great deal of harm results from this attitude. I have known of boarding-houses and hotels where sputum cups and all sanitary precautions are tabooed, and where patients, in order to gain admission, are compelled not only to lie, but also to disregard all sanitary precautions. On the other hand, familiarity breeds contempt, and in some of our resorts there are many places where sanitary precautions are either very lax or are disregarded simply through carelessness.

"In regard to the third question, I can recall a number of cases where former patients were refused employment because of the fact that they had had tuberculosis. This, of course, was not because they had been inmates of institutions, but only because their residence in such a place published the fact that they had had the disease. The above applies particularly to women who seek employment in the home, and in my experience more rarely affects men.

"In this connection I should like to call your attention to the policy of certain institutions of refusing to employ persons who have tuberculosis. It has always been my policy to give the preference to those who had the disease, always provided that they were in a condition to work. It is true that such a policy is more expensive and requires a great deal more worry and supervision on the part of those in charge. But I have always felt that since we send our patients out to take their places in the world it is our duty to prove that they can be restored to a condition of economic usefulness, and surely there is no better way of proving this than by force of example.

"I feel that the wonderful campaign of education carried on by yourself and the other leaders in our work is doing much to get rid of the ignorance and prejudice with which your paper is to deal, but it is only by constant reiteration of the simple truths that the end will be reached."

Dr. Martin F. Sloan, of the Eudowood Sanatorium, at Towson, Md., answered to question 1, "No"; to questions 2 and 3 he answered "Yes," and added: "We have had during the period of two years at least twenty cases leave because they were afraid they would develop more trouble than they at

that time had. This has been especially true in our advanced ward where the ambulant cases become frightened at the bed cases, though the former might have as much involvement as the latter, even if their symptoms were not as pronounced.

"Several ex-patients have told me of their difficulty to get suitable lodgings on account of their having been in the sanatorium. One man was forced to leave three different houses after it became known that he had been at Eudowood. Two known cases have had to seek employment elsewhere. On the other hand, however, I have been glad to learn from several business men that they would willingly employ patients, as they felt that they would be a valuable asset among their working-men rather than a detriment, as they had had instructions on lines of prophylaxis and sanitation. I might add, further, that it seems to me that during the last year some of this phthisiophobia has disappeared, and this can be attributed, I believe, to the wide publicity that has been given to this sanatorium and the methods pursued here. Of course, I am speaking of conditions as they come to me."

Dr. Theodore B. Sachs, of the Edward Sanatorium at Naperville, Ill., answered to question 1, "No"; to question 2, "No"; and to question 3, "Yes," adding: "Some Orphan Asylums or Homes reluctantly readmit or refuse admission to children discharged from sanatoria; they do not inquire if the case is open or closed; the mere fact of their having been in a sanatorium bars them. We had to do considerable educational work among the managers of such institutions to have them differentiate between communicable and non-communicable cases, 'closed and open cases.' Considerable educational work must be done among employers of labor. This we are trying to do now through the medium of the committee and factories.

"Much of the unjustified fear is due to the fact that the patient frequently does not know the nature of his ailment; the doctor considers it a good policy to call it 'a cold,' 'bronchitis,' etc. When the sanatorium man examines the patient he is frequently warned not to tell the patient the nature of his trouble. We certainly agree that the patient should know the diagnosis, that the diagnosis should be stated in a kind, encouraging way, and that with the patient knowing the nature of his ailment his co-operation is more readily secured and the battle is half won."

Dr. David R. Lyman, of the Gaylord Farm Sanatorium at Wallingford, Conn., answered to question 1, "No"; to questions 2 and 3 he answered "Yes," adding: "Quite a few patients have left on account of incompatibility of other patients. Only closest care in placing patients can guard

against this. The occasional careless patient (which we meet at times in all sanatoria) makes me quite a little trouble in this way.

"As a rule, the friends and fellow employees of our discharged cases have been most ready to extend full co-operation to these cases after their return to work. In a few cases, however, this ostracism has been carried to the point of absolute cruelty and is by no means a negligible factor. The worst case of this I have known of was incited by the doctor, who was the local health officer."

Dr. Ralph Apted, of the Grand Rapids Municipal Sanatorium, Michigan, answered to question 1, "No"; to question 2, "No"; to question 3, "No."

Dr. Horace Greeley, of the Hill Crest Open-Air Sanatorium at Hackensack, N. J., answered to question 1, "No"; to question 2, "No"; to question 3, "No."

Dr. Robert B. Homan, of the Homan Sanatorium at El Paso, Texas, answered to question 1, "No"; to question 2, "Yes," and added: "I had one patient leave the institution after being here but one night, giving as a reason that she could not stand to be around so many sick people, but she has engaged a room to try again right soon." To the third question he replied "No," adding: "I have never found that the fact that I had suffered with tuberculosis and had spent nine months in a sanatorium has had any effect upon my reception into society or the business world. Of course, this is a health-resort town, and a large per cent. of our population come here because of the health of some member of the family, and on that account conditions may differ in the East, but I do not believe that the fact that one has had tuberculosis would incline people to refuse to accept them into social or business circles any more than would typhoid or any other serious illness."

Dr. Herbert M. King, of the Loomis Sanatorium at Liberty, N. Y., answered to question 1, "No"; to question 2, "Yes," and added: "Very rarely some hypersensitive and neurotic patient has left the institution very shortly after admission, ostensibly because of the associations. Such patients are not desirable in any case, and the few who make up the number would probably not benefit by sanatorium residence. It has been my intention to get an expression from several patients who have come into the sanatorium reluctantly, and with more or less antipathy, and who have, as is usually the case, been won over to the enthusiastic co-operation in treatment, but I have not as yet had an opportunity to get more than two, which I enclose herewith. One is, as you see, from Miss X, a rather intelligent young woman connected with the Metropolitan Life Insurance Company, who had to be almost coerced into coming. As you see, she is in our Intermediate Division.

The other letter is from Miss Y, whom you know, a sister of Dr. Y. She has just left the sanatorium 'apparently cured,' probably to resume her teaching next fall. She has always been reasonable, and her letter, which came unsolicited, gives you an impression of what an intelligent, educated, and, at the same time, sensitive Quaker girl thinks of us" :

"My Dear Dr. King:

"I have been thinking over some of the harsh and unkind thoughts that I had in my mind about sanatoria when I first heard I had to come to Loomis, and thought you would like to know how my opinions have changed.

"I could almost picture a place where there were so many very sick people; so ill even in their appearance that it would only make me feel worse to have to mingle with them.

"Instead, I found many congenial people, with red, rosy cheeks and able to do as much, even more, than I could myself. I have been here at Loomis just nine weeks and have gained in weight, health, and appearance, and in every way have felt the benefits of Loomis.

"I also realize that the rigid discipline, careful medical attendance, regular meals, exercise and sanitary habits, are the cause of my improved health, and know that we could never follow the same rules at home no matter how good our intentions.

"Trusting that anybody with the same fixed, disagreeable thoughts that I had before entering Loomis will benefit by my experience and find the pleasant surprise that is in store for them to aid in regaining their health,

"Very sincerely,

"X."

"My Dear Dr. King:

"Though I thought of no more questions that I wanted to ask you, I intended to try to see you in the evening to bid you good-by; but it did not come to pass. So I am writing to tell you that my long stay at Loomis has been really a happy one, for the most part, at least, and that I shall have many pleasant memories of it, including you and your kindness to me.

"With many good wishes to you personally, and many thanks for what you and the place have done for me, I am,

"Very sincerely yours,

"Y."

Dr. Estes Nichols, of the Maine Sanatorium, at Hebron, Maine, answered to question 1, "No," and added: "We never have had any case of infection by visitors or employees during their residence at the sanatorium or any that have developed after leaving the sanatorium, which covers a period of eight years. We have to be on the constant watch, however, in employing help in all departments, because we find that many persons who fear that they have tuberculosis or perhaps have shown some signs, such as loss of weight,

cough, expectoration, blood-spitting, or a general rundown condition, as they speak of it, are apt to apply to the sanatorium for work. They frequently say that they have never had any trouble, but it takes only a short period of observation to realize that their attention has been drawn to their chest by one of these signs. I have in a number of instances examined the sputum of employees who have been in the sanatorium for less than two weeks and have found abundance of bacilli in it, and when we have accused them of knowing they had some trouble they have frankly admitted it and thrown themselves on our mercy. This is one reason why the management of sanatoria should be very careful in engaging help without knowing whether they are free from tuberculous disease or tendency. We have been convinced to our satisfaction that the sanatorium is a very safe place to be in, and I think that is the experience of every worker."

To question 2 he answered "Yes," and remarked: "I have occasion to see a great many patients who have failed to come to the sanatorium early enough because of a feeling of danger. This has been confirmed in many instances by the family physician. When the case gets far enough advanced at home, however, they lose their fear, but in most of these instances we are unable to help them on account of this delay. This feeling is one that should be overcome, especially with the medical profession. We have had but two patients who have left the institution shortly after arrival because of this fear. One of these cases was an advanced case, and I think that most of the patients were glad that she did not remain."

To question 3 he answered "Yes," and added: "I know of occasional instances of patients leaving the sanatorium with the disease arrested and being ostracized, mostly in a social way, but relative to arrested cases it is more apt to be the other extreme. In other words, it is more difficult to hold a patient down for a sufficient length of time because of the friends ridiculing the idea of their having 'real tuberculosis.' With the few cases who go out with the disease progressive there is not enough ostracism in many instances to make the patient careful. Ostracism has one good feature with these persons. It holds them up to a degree of carefulness that convinces their friends there is no danger. Some persons are apt to feel that this is a hardship, but I find in the patient body under treatment ostracism of careless patients by the patient body will have more to do in making that patient more careful than anything else. I do think there is a good deal of needless fear concerning the disease, and sincerely hope that your paper will bring out many of these points."

Dr. Victor F. Cullen, of the Maryland Tuberculosis Sanatorium, an-

swered to question 1, "No," to question 2, "Yes," and added: "We have had one patient, a far-advanced laryngeal case, who thought that there was nothing the matter with her, and she objected to the association of the cases in the pavilion, and went home on this account." To question 3 he answered "Yes," and added: "I know of several instances where patients have suffered ostracism because they have been at a sanatorium, although they left arrested and improved. This is mostly among boarding-house keepers, where, although the patient may have been at work elsewhere for one year, they were afraid to take them into their boarding-house on account of their having had tuberculosis. I have seen several instances where boarding-house keepers would not take in patients who had tuberculosis, and who used the proper means of disposal of their sputum and of taking care of themselves; yet these same people would take in an advanced consumptive, as long as he would sit on the porch and cough and expectorate on the lawn."

Dr. John Stewart, of the Missouri State Sanatorium at Mount Vernon, Mo., answered to question 1, "No," to question 2, "Yes," and added: "The only cases I know of leaving because of the association with other patients have been neurasthenics of the worst degree; and, in fact, they have all been worse off than the patient they complained of and we are always pleased to see them go." To question 3 Dr. Stewart replied "No."

Dr. W. B. Kendall, of the Muskoka Cottage Sanatorium at Gravenhurst, Canada, answered to question 1, "No," to question 2, "Yes," and added: "We have had one or two neurasthenics who have left the institution because they were not satisfied, but as for what the reason was I could not say; in fact, I feel that these patients should have gone to an asylum in the first place, as we were not prepared or equipped to take care of them. We find occasionally that some patients are naturally homesick for the first few days, when this soon wears off, and I feel that the moral effect of having other patients whose ideal is the same with them, is a great stimulus toward their following the treatment properly and getting good results. I consider this latter point to be one of the many reasons why patients can follow treatment to advantage in an institution rather than in the home." To question 3 Dr. Kendall answered "No."

Dr. E. S. Bullock, of the New Mexico Cottage Sanatorium, Silver City, N. Mex., answered to question 1, "No," to question 2, "No," and added: "Patients sometimes refuse to enter an institution because they think association with other patients would be unpleasant. After entering, however, I have never known one to leave on that account." To question 3 Dr. Bul-

lock answered "Yes," and added: "I have heard of many, many instances in which patients have suffered business and social ostracism, relatively or complete, which is the result of the medical profession's activity in promulgating ideas of the contagion of tuberculosis. Modern studies of tuberculosis have substantiated a growing conviction on the part of those most competent to judge that tuberculosis is a universal infection; that the worst thing that can happen to one is to be among the residual 2 per cent. who have not been infected in early life, for when infection occurs, which it is bound to do sooner or later, in the absence of the protective infection enjoyed by most people in early life, the result is a virulent type of tuberculosis which finds its analogue in experimental tuberculosis in animals."

Dr. Marion H. Ober, of the Portland Open-Air Sanatorium, at Milwaukee, Ore., answered to question 1, "No," saying: "I want to say that for five years now I have been connected with tuberculosis sanatoria in the South, West, and here, and have come very closely in touch with the patients, both incipient and advanced cases (mostly the latter), and have not as yet become a victim to the disease." To question 2 he answered "No," and added: "No one has ever left on account of unpleasantness on entering the institution, and it is surprising how very quickly they adapt themselves to the open life. Very few patients have returned to their inside occupations after leaving (not that they have left for heaven), but have gone on to the different ranches or into real estate and other occupations that keep them out-of-doors." To question 3 he answered "No," and added: "If people feared more the crowded churches and theaters and realized the sanitation of the various sanatoria we would have less difficulty in convincing our patients that there was less danger at sanatoria than at their own home."

Dr. F. M. Pottenger, of the Pottenger Sanatorium, Monrovia, Cal., answered to question 1, "No"; to question 2, "Yes," and added: "I recall only two who felt that they were obliged to leave the institution because they found the association unbearable, but I would like to say that these same two patients found the association at home unbearable and made it unbearable for those around them; in other words, they belong to the discontented class. The general rule is that the fear of the sanatorium being unpleasant and obnoxious nearly always disappears after a day or so in the sanatorium. Some of those who have feared coming the most have been the most ardent supporters of the institution after their arrival." To question 3, Dr. Pottenger answered "Yes," saying: "There is a great prejudice among the laymen against the tuberculous patient, and the laymen, unfortunately, do not differentiate between the trained patient and the un-

trained, neither do they differentiate between the patient who is in the open stage and the one who has secured an apparent cure. The very fact that a patient has been in a sanatorium or has taken treatment from a physician who is a specialist in tuberculosis, brands many of them and works injury against them when it comes to their association with the outside world. This is carried on to such an extent that I often find it best, in corresponding with my patients, to use plain envelops in order to conceal the fact that the person with whom I am corresponding has had anything to do with me. . . . I believe that we can do just as much for the prevention of the disease and just as much for its cure and inject far more humanity into the problem by making greater efforts against the unjustifiable phthisiophobia which now exists. I hope that your paper will have wide circulation and do much good along this line."

Dr. P. C. Bartlett, of the Rutland State Sanatorium, Rutland, Mass., answered to question 1, "No"; to question 2, "Yes," and added: "There have been a few cases that came to my notice where patients were not satisfied because they were obliged to be in an open ward with others. In most instances, however, these patients became accustomed to the routine and stayed. I believe a few, however, left for this reason. In most instances I do not think it was because they were associated with other tuberculous patients in rather close proximity, but because they were nervous and not accustomed to being with so many people during their sleeping hours." To question 3 he answered "Yes," and added: "It has happened, not infrequently, that some patients after leaving the sanatorium have reported that they have been troubled about getting employment or that they have had trouble with their fellow-employees because they were tuberculous. In all of these instances I have given a certificate stating that I felt that a conscientious, well-trained tuberculous patient, although there might possibly be some activity of the disease present, was not a menace to the community, and that I felt that our 'arrested' cases were in no way dangerous."

Dr. Oliver T. Hyde, of St. Joseph's Hospital, Silver City, N. Mex., answered to question 1, "No"; to question 2, "No," adding: "The general atmosphere is cheerful and optimistic." To question 3 he answered "Yes," and added: "I have noted that some patients having obtained a partial or complete arrest and desiring to live in private dwellings in the town have been discriminated against because of their sanatorium history. This, though, is the result of ignorance. On the other hand, I have found that arrested patients whom I have recommended to responsible business men for positions, and in whom it was possible for me to say that the lesion was

not active and the sputum was negative, were perfectly satisfactory to the employer, and they have obtained positions where in the ordinary course I am quite certain they would not."

Dr. Vincent Y. Bowditch, of the Sharon Sanatorium, Sharon Hill, Mass., answered to question 1, "No"; to question 2, "Yes," and added: "Homesickness and nervousness due to the mere presence of others, apart from fear of infection, have been occasionally causes for patients leaving. The number of those who have left from mere fear of infection has been very small, so far as we have been able to determine; and while I have had a good many who in applying have expressed this fear, the majority have ceased to harbor such thoughts after intelligent instruction during their stay at the sanatorium." To question 3 Dr. Bowditch answered "Yes," and remarked: "I have known of a few such cases among the many hundred who have left the sanatorium, and I believe there is, unfortunately, ground for patients feeling that they may be ostracized if they have been in a sanatorium. To a certain extent, in my opinion, this is inevitable on account of the irrational, cruel, and unnecessary attitude, which I deplore and deprecate, taken by some people who deal with former patients, no matter how well they are, who are not only not sources of danger, but who, from their knowledge of how to take care of themselves and others, act as missionaries among those with whom they associate."

Dr. Geo. M. Sternberg, of the Starmont Sanatorium, Washington Grove, Md., answered the three questions with "No."

Dr. Lawrence F. Flick, of the White Haven Sanatorium, White Haven, Pa., answered to question 1, "No"; to question 2, "No," and added: "So far as I know, no one who has entered the sanatorium and has remained long enough to become acquainted has left on account of association with other patients. This is the more remarkable since at White Haven Sanatorium there is no discrimination as to race or color, and we frequently have colored patients side by side in the same ward or in the same room. We also have had Chinese and Japanese mixed in with the other patients." To question 3 Dr. Flick answered "Yes," saying: "I have heard of business ostracism after leaving the sanatorium, but I do not know of authentic cases. White Haven Sanatorium has made it a rule to protect the patients as far as possible by guarding their identity and refusing information about them to all inquirers except the family."

To summarize the foregoing answers we may say that to question No. 1, asking whether any healthy individual had ever contracted tuberculosis

during his sojourn in the institution, all twenty-five sanatorium directors to whom letters were addressed answered "No."

To question 2, asking whether any newly arrived patient had left the institution because he found the association with other patients unpleasant, 13 answered "Yes," 12 answered "No."

To question 3, asking whether any patients had suffered social or business ostracism after having left the sanatorium, 13 answered "Yes," 12 answered "No."

The additional remarks of the sanatorium directors besides their value as answers to my questions are, of course, highly interesting and instructive and they speak for themselves. May I now, in conclusion, say a few words regarding my personal experience relating to this topic?

My experience during the relatively short time I served as assistant in a sanatorium corroborates in the main the negative answers to question 1. For my doctor thesis before the Faculty of Paris, entitled, "Les Sanatoria, Traitement et Prophylaxie de la Phtisie Pulmonaire," published as far back as 1895, I had similar answers from twenty-five of the leading European sanatoria. During the many years that it has been my privilege to be the senior visiting physician to the Riverside Hospital-Sanatorium for Consumptives of the New York City Department of Health, where the great majority of patients are in the advanced stages and come mostly from the ignorant and poorer classes, there has never been an authentic case of tuberculosis having been contracted among my assistants and nurses. This result in a hospital for advanced cases is, I believe, even more remarkable.

Regarding the matter referred to in question 2, I am willing to make the statement that not only will much depend upon the atmosphere of cheerfulness which the sanatorium director can create by his own personality and his example to his assistants, nurses, helpers, and patients, but also upon the physician who sends the patient to the sanatorium. Let this physician impress the patient with the idea that the sanatorium is "eine Heilanstalt" —a healing institution, that he must expect to see sick patients, but that by his own hopefulness, cheerfulness and determination to get well, and his ready compliance with the sanatorium rules, he can be productive of immeasurable good to himself and others.

During my stay at Falkenstein as assistant to that immortal teacher and pioneer of the sanatorium treatment, Dr. Dettweiler, I had occasion to witness manifestations of the greatest sympathy, particularly on the part of well-to-do patients toward their financially less fortunate brethren. It was there at that time that a few wealthy patients expressed their gratitude

for a complete recovery by presenting Geheimrath Dettweiler with a large sum of money for the purpose of establishing an institution similar to that of Falkenstein for the consumptive poor. This institution, the first in Germany for the tuberculous of limited or of no means, is now located at Ruppertshain, a short distance from the mother institution, and is one of the most flourishing and successful of all the European sanatoria.

Apropos of the antipathy some individuals have to entering a sanatorium, let me relate to you a true story which was communicated to me only last week. A patient whom I had sent to one of our leading sanatoria returned to me completely cured after a prolonged stay at the institution. I mentioned to her the subject of this paper, whereupon she told me the following incident which she had recently witnessed: A young woman in a rather advanced stage of the disease had entered the sanatorium two years before, much against her wishes and inclinations. On her arrival she was sure that she could not stand the environment and was prepared to leave as soon as she was rested sufficiently to take the homeward journey. But she began to improve, though slowly, and she soon realized that the place was not half as bad as she had imagined it to be. She became one of the most faithful and obedient patients, carrying out with enthusiasm the orders of the physician. It took two years to cure her, and the other day, when her physician at last told her, "You are cured, you may go home," she rejoiced, of course, but when the time for her departure came she shed bitter tears over leaving the place where she had been so happy and contented, where she had regained her health, and had made so many friends. My narrator said that the adieus were pathetic in not a few instances, and when recalling her own farewell from the institution I noticed a moisture in her eyes.

I believe all objections to entering and remaining in a sanatorium can be overcome if the physician can be persuasive enough to make the patient perceive that he has now a mission before him, not only to help himself but to help others as well, and that by the knowledge and training he will receive in the sanatorium he will become a sanitarian, a hygienist, a factor of real good to his fellowmen, particularly among those to whom he will return after his restoration to health. I really think that I have won over many a patient to the sanatorium idea by such heart-to-heart talk.

My experience with the more advanced cases coming from the poorer classes has, however, convinced me of one fact which I fear our authorities do not take sufficient cognizance of. If we wish to retain an advanced case in a hospital for isolation, we must make the environments of this patient as attractive, as pleasing, and as sympathetic as possible. If we fail to do

this, the advanced case will prefer to do with a little less comfort; in fact, even to put up with less good food, a less clean bed, and less pure air, if he is only allowed to die in his home.

And now a last word concerning the social and business ostracism to which discharged patients are, alas! so frequently subjected. Wherein lies the remedy for this type of phthisiophobia? I do not quite agree with some of my colleagues who hold the campaigns of our health departments responsible for this type of phthisiophobia. In all the health department literature which has come under my observation the statement that the clean, conscientious consumptive is as safe an individual to associate with as any one else has always been emphasized. It is rather that the employers should be convinced that a tuberculous patient, even if his case is not arrested and not completely cured, or when the cure is only an economic one, is best fitted by his training in the sanatorium to become absolutely safe to associate with, if the hygiene in the factory, workshop, or office is not so bad as to make nearly everybody sick. We not only need a little more education, but also a little more charity toward our consumptive fellowmen. The tuberculosis problem will not be solved by phthisiophobia but by a humane, just, sympathetic, and helpful attitude toward patients within and outside of institutions. Fortunately, this world is growing better, and I for one, at least, see brighter and happier prospects for the patients entering and leaving sanatoria. As stated above, when they are rightly taught and rightly trained, they are bound to become the most valuable co-workers in our anti-tuberculosis propaganda and labors for the consumptive poor, particularly so when they are imbued with the idea that though they may be seemingly disabled, they are still valuable and useful members of society. Let them feel that by their conduct they may join in what is a sacred mission to all of us; namely, service to mankind, which in the end is the highest service to God.

EXAMINATION OF EMPLOYEES FOR TUBERCULOSIS

By Theodore B. Sachs, M.D.
Chicago

It is in the interest of the employer, the employee, and the community at large, that every case of "open" tuberculosis in a working place should be known and controlled, that diagnosis should be made *early* in workers with active tuberculosis, and that proper cognizance should be taken of the workers with low resistance due to latent tuberculous infection or other causes.

Detection of these groups of cases among employees requires the operation of a system of examinations, the watchword of which should be "early diagnosis."

THE PRESENT CONCEPTION OF "EARLY DIAGNOSIS" AND THE METHODS OF ATTAINING IT IN A COMMUNITY

The conception of the term "early diagnosis" has undergone considerable transformation during the last two decades. The tendency is toward earlier recognition of the disease. The case considered "incipient" today is more incipient than that of twenty years ago.

It is in the interest of the community that tuberculous infection in individual cases be recognized and proper treatment instituted long before the characteristic symptoms appear, and that proper cognizance and adjustment be made in the case of the large group of individuals lacking the average degree of resistance (the so-called "predisposed").

Among the agencies promoting early diagnosis of tuberculosis, tuberculosis dispensaries occupy a foremost place: *first*, through their continuous educational campaign emphasizing the importance of early diagnosis; *second*, by furnishing free medical examination to those unable to employ a private physician; *third*, by extension of the examination to all "contacts" in homes in which a case of tuberculosis is discovered.

Important as the dispensaries are, they deal, to a great extent, with individuals whose condition is either grave enough to arouse in them a fear of possible presence of tuberculosis or who are so impoverished by the disease that they cannot afford the services of a family physician. An analysis of dispensary statistics will show more or less long periods of impairment of health or even invalidity in a large percentage of cases before their appearance at the dispensary.

Early diagnosis, as we understand it today, should be the diagnosis of the infection in the individual, long before he feels really sick: in the worker, while he is at work; in the child, while it is at school, etc.

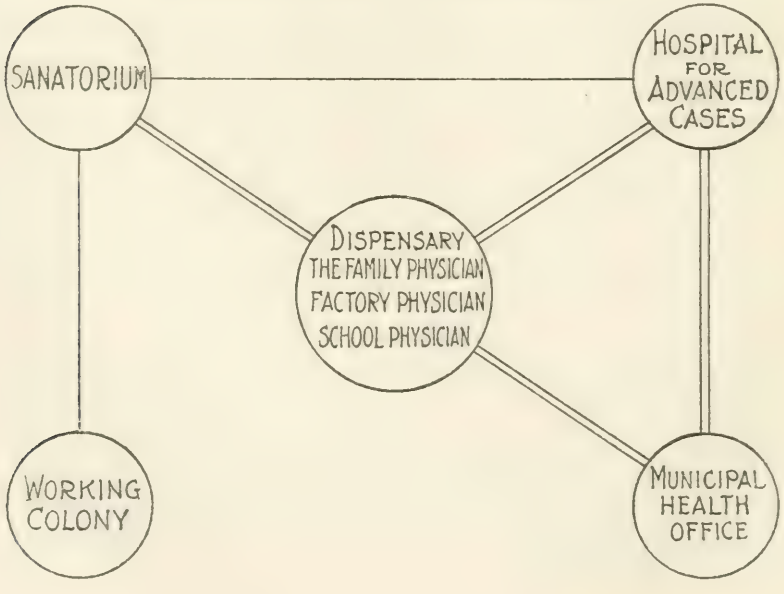
To render "early diagnosis" possible, we must possess the machinery for diagnosing the disease at a time when the individual may not *even* suspect its possible presence. The medical profession at large, the school physician, the factory physician, and the dispensaries are the four important factors in early diagnosis of tuberculosis in a community. To show this diagrammatically, I have added the first three factors (the medical profession, the factory physician, and the school physician) to the well-known scheme of "control of tuberculosis" as drawn by Dr. Philip, of Edinburgh.

The right conception and an agreement on the part of the four (the dispensary, and the family, factory, and school physician) as to what is "incipient" tuberculosis, and the determination on the part of the community to provide the necessary machinery for diagnosis in all cases and under all conditions, are very essential to the gradual solution of the tuberculosis problem.

CO-ORDINATION OF ANTI-TUBERCULOSIS MEASURES IN A COMMUNITY

By Dr. R. W. Philip

(with some additions, as above stated)



IMPORTANCE OF PROVISION FOR DETECTION OF TUBERCULOSIS IN WORKING PLACES; METHOD OF ITS INTRODUCTION

As stated above, early detection of tuberculosis in an employee is of great importance to himself, his co-workers, and his employer. It means a better and, at times, the only chance of recovery; it means prevention of infection of others and an uninterrupted or a longer period of usefulness of tried and experienced men.

It is impossible to foretell at present the ultimate source of provision for the early detection of the disease in workers. The signs of the times point to the eventual recognition by the State of this provision as one of the sanitary requirements in every working place, the expense being borne by the State, the employer, the employees, or all three combined.

In Chicago, it appeared to me that the introduction of a system of examination of employees for tuberculosis should be attempted at the point of least resistance, namely, in concerns possessing welfare provisions for workers (employees' benefit associations or various other provisions which point to an enlightened attitude of a firm toward its workers, etc.). The ultimate object is to see the membership of the employees' benefit association gradually extended to the entire working force, or a large proportion of it, and to make the examination of the employee for admission to such associations and, later, in time of illness, so comprehensive as to gather any cases of tuberculosis existing in the place.

A general provision for examination of all suspicious cases is, however, necessary even with the benefit association including the entire working force. Eventually each working place or several together (according to the number of employees) should have a physician who shall act as the sanitary officer and whose duty shall be the supervision of the health of the workers and hence early detection of disease in individual cases. At present a provision of this kind has to be financed either by the employer himself or in conjunction with his employees.

In campaigning for introduction in working places of a system of examination for tuberculosis, due cognizance should be given and full advantage taken of the pre-existing medical or "welfare" arrangements, so adjusting the details of the proposed system of examinations as to insure its early introduction and successful development.

The important thing in Chicago, as it would be in any other city, was to *interest* the employer in the *necessity* of such examinations. The chief

obstacle to the introduction of any system was the lack of information on the part of the employer that there is any such thing as a tuberculosis problem in his place, as well as the lack of appreciation on his part that any benefit can accrue to the firm through the operation of such a system.

In making the appeal to the employers, I have placed emphasis on the financial loss sustained by the employer through the imperceptibly growing reduction of working power in the early stages of the disease, the danger to the entire working force from the unknown, uncontrolled "open" cases of tuberculosis, the constant infection of other workers, the subsequent loss of experienced men, the reduction of the general efficiency of the entire working force through the existence of uncontrolled sources of infection, etc. In our campaign we were materially assisted by the humanitarian attitude of the employers toward their workers.

Early in the campaign I devised a chart which proved of value in the conferences between the Committee on Factories of the Chicago Tuberculosis Institute and the employer whom we were eager to enlist. The chart, as here reproduced, shows in concentric circles the various groups of tuberculosis cases which you would expect to find in a working place; the size of the circle showing in a general way the relative number of workers included in each group and the degree of shading pointing to the relative importance of the group from a sanitary standpoint.

It is very essential to make it clear to the employer that systematic examination of employees for tuberculosis will disclose not only the "open" and "active" cases of tuberculosis, the solution of the majority of which lies in institutional treatment, but also the larger group of workers in whom a predisposition exists either because of latent infection or because of malnutrition, anemia, etc. One of the important objects of the examinations, the employer is told, is to raise the resistance of these groups by proper medical advice, education in right living, change in occupation if necessary. By the spread of this education in "right living" among the employees the final result is "a higher standard of health and efficiency of the entire working force."

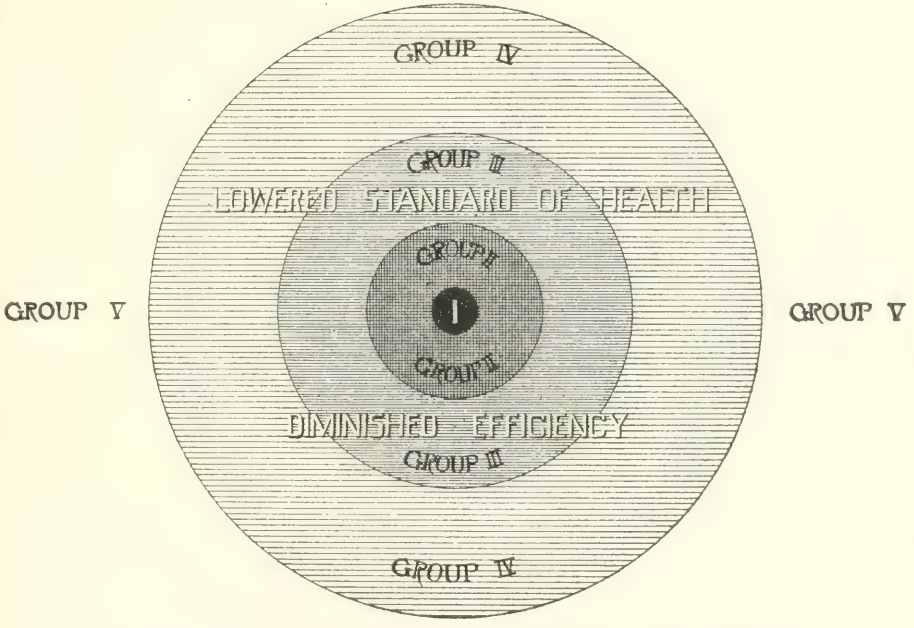
PLAN OF EXAMINATION OF EMPLOYEES FOR TUBERCULOSIS

From the standpoint of prevention of tuberculosis among workers and preservation of their efficiency, the best policy would be the application of medical examination to all new employees for the purpose of eliminating any existing disease and determining their physical fitness for the given task, the examination being repeated at certain intervals or whenever any

The TUBERCULOSIS PROBLEM IN A WORKING PLACE

by Theodore B. Sachs

GROUPS OF WORKERS



CONDITION		REMEDY
GROUP I *Tuberculous.*	*"Open"-Communicable Cases.*	*Periodic Medical Examinations*
GROUP II *Tuberculous*	*Disease-Active, Progressive.*	*Right Conditions for Entire Working Force.*
GROUP III *Tuberculous.*	*Disease-Inactive.*	*Education of All in Right Living.*
GROUP IV	*Workers With Low Resistance.*	*Hospital & Sanatorium Treatment for Groups I, II & part of III.*
GROUP V	*Workers in Average Health.*	

RESULT

HIGHER STANDARD of HEALTH AND EFFICIENCY

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suspicious signs arise. This, of course, is difficult of attainment under the present conditions, though the tendency is in that direction. As conditions exist at present, the general principle of examination of employees for tuberculosis should be agitated in all working places. The size of the place will determine, however, the feasible arrangement for such examinations.

In smaller establishments it is desirable that the employer or foreman be made familiar with the various manifestations of incipient tuberculosis, that information on this point be disseminated among workers, and that those unable to pay for medical services should know where to secure a free examination. Smaller establishments may engage a physician for a part of his time or combine with other establishments for this purpose. Whatever arrangements are made, abuse of medical charity should be avoided, and co-operation established and maintained between the physician representing the firm and the family physician of the worker.

In larger establishments the work of examination for tuberculosis should be either assigned to the physicians already in the employ of the firm or a new man appointed to attend to the tuberculosis cases exclusively.

Finally, the plan should resolve itself into making an examination for tuberculosis an important feature of the general medical examination.

The details of the plan* submitted to the Chicago Tuberculosis Institute one year ago and since then advocated under the auspices of its Committee on Factories is as follows:

1. *Physician to examine all suspicious cases.*

In places with established medical service this task may be assigned to the physician on the staff of the firm. In large establishments a special "tuberculosis" examining physician may be necessary. In either case, possession of special experience in the diagnosis of tuberculosis is very important.

Duties of the physician: Examination and diagnosis of cases; disposition of those found tuberculous; instruction of the sick in the essentials of treatment and of the "predisposed" in right living and in measures tending to increase the general resistance; frequent noon or evening talks to the entire working force on maintenance of health and prevention of disease.

The hours of work of the physician are determined by the extent of the problem: one, two or more afternoons a week; or a regular daily service. Compensation should be graduated according to the amount of work and the individual qualifications.

* First published in "The Survey," October 21, 1911.

2. *Trained nurse to assist the physician.*

Duties: To assist the physician during clinic hours; to visit and study the homes and living conditions of employees pronounced "tuberculous" or "predisposed"; to instruct in the fundamentals of right living and in the methods of care and prevention, by actual demonstration in the employee's home; to gather in each individual case information essential to its right solution.

Compensation: That of a visiting tuberculosis nurse, regulated by the responsibilities of the position and individual qualifications.

3. *Classes of cases to be examined.*

At a conference between the superintendent, the physician, and the nurse it is agreed that the working force is to be watched for the following classes of cases:

(a) Employees in whom diagnosis of tuberculosis was previously made.

(b) Employees whose poor general condition (malnutrition, anemia or weakness) in connection with other suspicious symptoms suggests the possible presence of the disease.

(c) Employees with histories of protracted (or recurring) cough and expectoration.

(d) Employees in whose families or homes a case of tuberculosis exists or in which a death from tuberculosis occurred, etc.

In large establishments a circular letter may be sent, previous to the conference, to all superintendents or foremen, calling attention to the above-mentioned classes of cases and explaining the object and scope of the proposed examinations.

4. *Tuberculosis Clinic.*

With the compilation of a list of suspicious cases, a tuberculosis clinic is established on the premises of the firm, in which all such cases are subjected to a thorough medical examination.

Each individual case is classified—(a) according to diagnosis: "tuberculous" or "non-tuberculous," "active" or "non-active," "open" or "closed"; (b) according to necessity of change of occupation or discontinuance of work; (c) according to need of hospital, sanatorium or home treatment.

The solution of each case is considered after a full analysis of all its medical and social aspects.

At times some difficulty may be encountered in persuading an individual member of the force to undergo the examination, but, as in all matters, diplomacy and kindness will overcome all obstacles.

Besides serving as a diagnostic station, the clinic maintains continuous supervision over (a) employees classed as "predisposed"; (b) employees returned to work, with disease "apparently cured" or "arrested" by institutional or home treatment; (c) employees taking "home treatment" and assigned to the clinic by the employer.

Since the submission of this plan to the Chicago Tuberculosis Institute

a year ago, a systematic campaign for its adoption by industrial concerns in this city has been carried on by its Committee on Factories. At present the plan is in operation in shops and offices of the International Harvester Company; Montgomery, Ward & Company, and the Chicago Telephone Company, and has just been adopted by Swift & Company. The firm of Sears, Roebuck & Company has for some time given special attention to tuberculosis in their examination of employees.

CONCLUSION

Very important considerations prompted the campaign in Chicago for the introduction of systematic examination of employees for tuberculosis: *First*, the realization that *early* diagnosis of tuberculosis can be best attained with a system of examination of working people, that will detect the disease long before the pronounced symptoms manifest themselves, detected while the employees are at work frequently unsuspecting the presence of any disease; *second*, the operation of a system of examination in a working place and the knowledge of the existing conditions gained thereby eventually lead to the improvement of sanitary conditions and enlist the support by the employer of adequate and efficient institutional provision for the treatment of tuberculosis (the employer's interest in the anti-tuberculosis campaign is of vast importance); *third*, the further realization, on the part of the workers, employers, and the community at large, of the present utter helplessness of a worker in case of illness will lead to more comprehensive measures for the protection of the worker and his family, when illness keeps him from his employment (further extension of the principle of the employees' benefit associations, workmen's insurance, etc.).

Experience in anti-tuberculosis work in a community teaches us that support of any element in the community can be permanently gained by a clear demonstration of the relation of that element to the existing problem, and this is becoming apparent in our present campaign in Chicago.

To summarize: The aim of the proposed plan of examination of employees for tuberculosis is, *first*, detection and suppression of sources of infection in the working place; *second*, detection of cases of the disease in the curable stages; *third*, guidance of all employees predisposed to the disease and of those who are re-employed after having recovered their health by sanatorium or home treatment; *fourth*, guidance of all employees in right living and methods of prevention.

*Those who wish to get further details of the plan in operation may write for a pamphlet on this subject to the Chicago Tuberculosis Institute, Otis Building, Chicago.

The watchwords should be: Education, Detection, Control.

The hand of the engineer is on the throttle of the manufacturing machinery; the hand of the physician should be on the health of the working force; a higher standard of health means greater efficiency.

DISCUSSION ON PAPERS BY MR. HOFFMAN, DR. KING, DR. VOGELER, PROFESSOR FISHER, DR. KNOPF, AND DR. SACHS

Dr. A. M. Forster, Colorado Springs: Dr. Vogeler, in one of his conclusions, says that the farm colony idea is impracticable. I am not sure by what subtle means of deduction he has reached that conclusion. I do not believe that he has tried the farm colony or that he can cite any case where the farm colony has failed. I think he is putting the case a little too strongly. At Eudowood, where the farm colony idea has been very carefully worked out and put into practice, I believe the opinion is that during the six years of its existence it has been highly successful.

Another of Dr. Vogeler's objections is that we cannot get city people to work in the country. He should go further and explain just why you can't get city people to work in the country. Various efforts to institute a movement back to the land have failed largely through lack of sympathetic appreciation of the point of view of the city slum dweller. As I pointed out in the paper to which Dr. Vogeler has referred, it is out of the question to look for success where you take the city dweller into the country and there leave him unaided to work out the problems of his new environment.

But in the sanatorium and farm colony we have a splendid opportunity to make the change so gradual that by the time the patient has sufficiently recovered to render him economically independent, he has learned enough to encourage him to change his mode of life.

Another criticism Dr. Vogeler made was in regard to summer heat, and that is, I believe, the most logical of all his objections. However, I have found from experience that patients stand the heat on the farm as well as they do in the city. I have been in factories and sweat-shops in Baltimore where there was not a breath of air stirring, where the air was laden with dust winter and summer, and where conditions were a thousand times worse than in the hay-field on the farm.

It is very true that we will not have accomplished our full purpose until we have made conditions so perfect that men may live and work either in the city or the country without danger to health, but in the mean time—and the mean time is apt to be of some duration—we must work along the

lines of least resistance, rather than fold our hands and wait for the revolution.

If all the patients belonged to the class Dr. Vogeler evidently has in mind, his plan for modifying their environment would be sufficient.

Where a man or a woman has an intelligent and generous employer who is willing to make the task fit the patient's strength, and where the home conditions are not hopelessly bad, there is no reason for not sending the patient back to his old occupation. However, for even such cases the farm colony offers a longer term of treatment at a far lower cost than the sanatorium.

But what are we to do with that large proportion of cases whose environment in the city cannot be modified? And what will you do with the cases who, in spite of improved environment, break down again? There is always a limit to what you can expect from the employer or the charity organization, but in the colony useful work can always be found for the weakest.

I really don't wonder at the poor man's dread of country life when I hear some of the absurd and exaggerated ideas which prevail generally among intelligent city dwellers. It is true that conditions are not ideal in the country, but at their worst they can hardly equal those in the city. Farm machinery has done away with a great deal of the drudgery and the trolley does away with the former isolation. The rapid growth of scientific truck gardening furnishes ample opportunity for light outdoor work the year around.

However visionary our ideas may be as to the merits of agriculture as a permanent form of employment, there can be no argument as to the value of the farm colony as a means of prolonging the term of treatment. With the present cost of sanatorium treatment it is not justifiable to keep patients in idleness after they are in physical condition to do some labor.

The Eudowood Farm Colony has at least done this:

It has afforded a large number of patients an opportunity to live under ideal conditions for a sufficient length of time to insure their recovery.

It has furnished the sanatorium and hospital with an abundant supply of fresh and canned vegetables and pure milk, and has brought the cost of maintenance to a point below that of any similar institution in the country.

If the critics of the farm colony idea would only spend a day at Eudowood and investigate the conditions for themselves, there would be no occasion for these remarks.

Dr. S. Adolphus Knopf, New York: I should like to take an attitude somewhat between the opinions expressed by the last speaker and Dr. Vogeler. I believe occupation is a most important phase of modern phthisio-

therapy. Although I do not treat patients any more myself, I have frequent occasion to watch the patients who return to me from sanatoria where occupation therapy is in vogue. I can recall a number of patients who had come back from Loomis, and I have found that those who could do a certain amount of work which was prescribed for the purpose of producing sufficient tuberculin in their systems to create enough antibodies to combat the bacilli had done exceedingly well under this plan. Unfortunately, we cannot apply this occupation therapy except in institutions and isolated instances where the patient can be carefully watched. To prescribe work for a tuberculous patient with a view to producing just enough tuberculin is an exceedingly dangerous thing when we must leave the amount of work to be performed to the discretion of the patient.

Suitable work some time prior to and after the arrest or cure of the disease is, to my mind, of incalculable value to the patient. By suitable work I mean work to suit the physique and the mind of the patient; work which makes him happy and contented—in other words, a pleasant occupation.

Such occupation therapy during the convalescent stage, under proper supervision, will help to solve the problem of what to do with the countless number of patients who cannot remain long enough in institutions. I would, therefore, very strongly advocate a movement creating what I would wish to call "intermediate stations." Here the recovered tuberculous patient should, if at all possible, find work with which he is familiar, with which he has before earned his living, and with which he will have to earn his living thereafter. Thus, for example, if a man has been a tailor, let him do some tailoring; if he has been a shoemaker, let him do shoemaking; if he has been a bookbinder, let him do bookbinding; and so on. It goes without saying that these intermediate stations should be models of sanitation and that all work which can be so done should be done outdoors. Such intermediate stations should be institutions supported by the State or municipalities, for it is the commonwealth which will be particularly benefited by a greatly reduced number of relapses. Thus a true financial gain will in the end accrue to the commonwealth from the establishment of such intermediate health or sanitary work stations.

I wonder whether Professor Fisher has taken into consideration in his calculation the cost of maintenance of little children who are tuberculous. It seems to me that there must be a great economic loss by the death of children from tuberculosis at various ages. For example, we are spending thousands and thousands of dollars for the education of the child actually tuberculous or strongly predisposed. When the boy or girl arrives at pu-

berty, he or she is forced to take up the struggle for life and may fall a victim to tuberculosis. Thus, vast sums are spent by the State virtually uselessly, and the sacrifices made and money spent by the parents are likewise made and spent in vain. The remedy for all this is antenatal and postnatal prophylaxis, and preventoria and open-air schools for as many children and for as many grades as is at all practicable. The indoor school should be the exception, the open-air school, the rule.

John R. Shillady, Buffalo: I wish to comment on the paper with respect to employment only to this extent: A committee of the board of trustees of Ray Brook which has been studying this question for a year has come to the general conclusion that the old occupation in which a man was formerly employed affords as good an opportunity as a change to a new one, provided it be not in itself detrimental to health in a normal sense. I wish to dissent from an overemphasis of the idea that the fourteen or odd hours outside of his employment are so important a factor, as compared with the occupation of a returned sanatorium patient. I have read the literature of a large factory employing young people of both sexes in which the argument was made that from seven to five-thirty was not too long, if only the young people would not stay up too late nights. The truth in the statement that the use of one's leisure must be wise should not obscure the equally true doctrine that every one has a right to leisure and a shorter work-day than often prevails.

I am not so hopeful of the efforts to secure favorable working conditions for our patients unless we bend our energies to securing better conditions for all. Instead of removing the weak from the dusty factory, we should remove the dust itself and prevent what later it is more difficult to cure.

I consider Dr. Sachs' paper one of the most important papers read before this section. In Buffalo three employers met with me and agreed to pay seven dollars a week for nine months to the families of tuberculous employees. At first they proposed paying for treatment, to which I objected. I told them the city or State would pay for that. They could do better by caring for the family.

Buffalo does pretty well in early diagnosis. We have a large percentage of cases in the New York State Hospital, and yet 70 per cent. of all the cases reported to the Department of Health are beyond the first stage. That emphasizes the importance of early diagnosis. You cannot wait for the patient to come into the physician's office—you have to go after him. You have to do exactly the same kind of aggressive work as the social worker does in other fields. We can urge and secure examinations in families already

under the care of a social agency, but we have not yet devised a means of getting at it with the employer, and the suggestion which Dr. Sachs has made that we work it through the factory as the natural finding place seems to me to be worth the attention of every tuberculosis worker in the country.

Ernest D. Easton, Newark, N. J.: Perhaps instead of going to the factory we might start with the open-air school. I believe that open-air schools are as good to prevent phthisiophobia as anything, perhaps better than the examination of factory employees, because from the school the children go to the home, where they create a feeling that the disease is not so dangerous. The children rather glory in the fact that they are in an open-air school, where they have plenty of good milk and food. When they are cured there may be some announcement in the press, which makes them feel proud of the distinction. I believe there are a great many children not being cared for in our open-air schools that we should look after. We must hunt them up. We have been making an investigation in Newark recently, and we have, according to the physicians, about 100 tuberculous children. There are perhaps 100 more that we have not found. According to the Boston and Swedish estimate, 1.61 per cent. of all children are tuberculous. On this estimate with 70,000 school-children in Newark, there should be 1000 with tuberculosis. We are not doing our duty unless we set our nurses to work to find these tuberculous and the pretuberculous children, and place them in open-air schools if possible. They will help to get rid of phthisiophobia faster than the factory employees. I think we should also follow up the factory employees.

The Chairman: I am very glad indeed that this question of tuberculous children has come up for discussion, because at the last meeting of the German Central Committee practically the entire session was devoted to this subject, and some startling statistics were presented. According to the statements made, the proportion of tuberculous children was much larger than is generally assumed, and if this assumption should prove to be correct, the question, of course, becomes one of supreme importance.

Irving Fisher, New Haven, Conn.: The average after-life that is supposed to be cut off by the death of the consumptive includes seventeen years of working power, and in that figure is included the after-life cut off from children who die before they reach that age. But their after-life would naturally include a great deal more than seventeen years of working power. The matter of school expense, etc., was not taken into account. The number of children who are tuberculous is a subject of which I suppose very little is known.

In behalf of Dr. Lyman, who is not present, I would like to say just a word in regard to Dr. Forster's comments. Dr. Lyman, Medical Superintendent of the Gaylord Farm Sanatorium, has made a study of this subject. In a general way we have been underestimating the importance of wages and overestimating the importance of fresh air and occupation. Dr. Lyman has changed his mind. He has come to the conclusion that it is best, where we can, to recommend a return to the original employment, even if it is in the factory, advocating, of course, fresh air and ventilation inside and outside of the factory, insofar as that is possible. These are the results of his special investigation of several hundred of our patients.

Dr. H. R. M. Landis, Philadelphia: I cannot escape the conviction that perhaps in many ways the question of employment has been overestimated and the fundamental importance of the housing as a contributor in the tuberculosis problem underestimated. It is inconceivable to me that our sanatorium results are ever going to be any better than they are when so many of our patients—I mean the very sort we have got to help, the laboring class—are returned to housing conditions where it is utterly impossible for any individual to maintain his health. It seems to me that this problem of how and where the individual lives is the crux of the whole situation. I believe, so far as our cities are concerned, that we are going to see at least fifty per cent. of our sanatorium patients relapse by returning them to these unsuitable surroundings, and this condition is going on even if you make the working place as nearly ideal as you can. I know of a large number of patients who are working under the most ideal conditions. Nobody can find any fault. But the houses in which many of those people live are absolutely unsafe.

I recently encountered a rather interesting observation in going over some histories. I found in thirty-five instances that some member of the family was following one of the tailoring trades, the individual being healthy. Now, living in the house with a tuberculous individual, if the tailor developed tuberculosis, we charge it up against the trade.

Dr. Woods Hutchinson, New York: I think that the question we have been debating this afternoon is very rapidly coming to a focus, and that our program has been admirably made up, beginning with the interesting demonstration of what is being done by the great, intelligent government of Germany, which, when it sees a thing is necessary for the public health, goes to work and does it, no matter what it costs. If we can get 900 per cent. on our investment, surely no government would hesitate for a moment to apply all the money there is, if necessary, to the problem.

Employers in Germany are now insisting on any new workman they engage showing a clean bill of health, so that in this way a great many cases of incipient tuberculosis are discovered. The same thing has been done in England. Lloyd-George's insurance bill, which our selfish profession is fighting tooth and nail, provides a million and a half pounds for sanatoria, free sanatorium treatment for the worker, and support for his family when he is in the sanatorium. A similar plan on a smaller scale is being carried out in some of our large New England factories, where the employer and workmen get together and guarantee his expenses at a sanatorium.

But, after all, how far have we got? I was greatly impressed with an exhibit of some of these large German sanatoria at the great International Congress on Hygiene at Dresden last summer, showing the results obtained. They were very beautifully represented, but their graduates died regularly at the rate of about 10 per cent. per annum, so that at the end of nine years 85 per cent. were dead. We are not getting ideal results, even in Germany. What we have got to do is to prevent tuberculosis—attempts at care are little better than trifling with the problem.

Then we come to the worker after he has gone to the sanatorium and got his disease healed. Five or ten years in a workingman's life may make quite a difference. The farm colony has been tried. It is an admirable thing for those who are tough enough to survive it. You have to be born to it and trained to it from your earliest infancy. It means working from ten to sixteen hours a day and living on what you cannot sell. That is what farm life is when you strip the poetry from it. If anybody could find a light occupation in the open air, the lightest thing about it would be the wages. The patient had better go back to the indoor, unsanitary occupation he has been engaged in and earn more money to buy food with. That brings us to the real crux of the whole problem. As Dr. Vogeler read off the unhealthy occupations, I wondered if there were any healthy occupations. Industries are not constructed and planned with the slightest reference to the health of the workers, and yet that is their most valuable and important product. I doubt if there are half a dozen indoor occupations that do not definitely shorten the life of the individual worker. We should set to work to reform the principles upon which our wages are adjusted or we will never make a success. It is to the best interest of the community to so adjust the wages of our working classes, to so improve their surroundings, that they will be able to keep healthy themselves and raise healthy children. The healthiest occupation is the one that pays the highest wages.

Dr. William H. Welch, Baltimore: I do not know that I have anything

to add, except perhaps to emphasize the point that a definite program for the prevention of tuberculosis must, of course, be based upon accurate knowledge as to the causes of the disease and the mode of its spread. While we possess a sufficient amount of knowledge to justify us in going along certain well-understood lines, and while we do not have all the knowledge we would like, it is nevertheless true that we do lack positive, exact knowledge with reference to certain very fundamental problems relating to the origin and spread of tuberculosis. And until we have that knowledge there will be a certain amount of doubt as to the value of some measures in prevention.

One of the speakers called attention to the question of the virulency of tuberculosis in early life. The results there are simply startling. We have now a very exact method of diagnosis of tuberculosis in the tuberculin test, and in forms of the test which are far more delicate than those first employed by Koch. By this means these very significant facts have been positively determined. Children when first born have no tuberculosis, or so exceptionally as to be a curiosity. During the first year of life there is practically no tuberculosis. In the second half of the year cases begin to appear, so that toward the end of that year it is not so extraordinarily uncommon. But from the first year on the number of cases increases, until between twelve and fourteen years of age in children in large cities, of the classes which come to hospitals, practically 95 per cent. have tuberculous infection. Now that means, of course, that we must make a very sharp distinction between the disease tuberculosis and the infection with tubercle bacillus. Doubtless everybody in this room would give a positive reaction with tuberculin. Practically all in this room have a little tuberculosis. That is, of course, a very significant thing. This also is significant, that when tuberculosis appears in the first years of life, under five or six years of age, it appears most commonly in the fatal form, that is, if tuberculosis is found in that early period it is usually found as the cause of death. But from that early period on the active form of tuberculosis becomes less and less common, until we have the majority of the cases in the so-called latent, inactive stage.

Another thing: This little tuberculosis we have is protective, and by virtue of that we are enabled to take care of any ordinary dose of tubercle bacilli which we receive into the body. The points bearing upon the sociologic or preventive side are, then, mainly these: We should lay a far greater emphasis than has been customary upon the prevention of tuberculosis in early life. You might inquire why, if this little tuberculosis is protective, why should we be anxious about it? We cannot avoid this little

infection. The issue depends upon the number of bacilli and the virulence of the bacilli. The fate of the individual depends to a considerable extent upon the extent of that primary infection, so that we should do everything to guard against the infection of little children with tuberculosis. We will get what has been spoken of sometimes as beneficent vaccination, but we should guard against this infection during childhood.

Then when tuberculosis appears in later life, to what extent is it due to renewed infection? That is one of the open problems. It is not necessary to suppose that when tuberculosis makes its appearance in young men and young women from seventeen to eighteen years on, who are about to assume the responsibilities of life, there is a sudden rise of tuberculosis in that period. It is not necessary that there has been a recent infection. Tubercle bacilli may have been received in early life and remained latent. The condition which is produced by this primary infection is called allergy. We should guard against this lowered resistance to tuberculosis. We have been right all along and we have new scientific evidence in support of that view in laying great emphasis upon all hygienic measures, upon fresh air, upon proper diet, upon economic conditions, upon parks and playgrounds. That part of the program against tuberculosis rests upon a perfectly sound basis, namely, that we do not permit this protection which we have to be destroyed, this allergy to be lowered as the result of unfavorable conditions of living. I would simply emphasize the interest which I think sociologists should have in the newer study and discoveries in tuberculosis, and the significance of the fundamental fact, the great thing that has come out in recent years, that tuberculous infection is all but universal by the time one reaches adult life.

S. P. Withrow, Cincinnati: I should like to ask Dr. Knopf if he can give me a remedy for the prejudice against sanatoria. In Cincinnati that is one of the great problems. The patients come back dissatisfied. One complaint is the food. They complain of the patients with whom they have to associate. They complain that the coughing is unpleasant. A patient is often told, "A patient died in that bed, and you have come to do the same thing." They are met with all sorts of statements of that kind coming from the patients. In institutions like ours in Cincinnati, of course, there are a great many deaths. How, I would like to know, could an institution be arranged so as to overcome that feeling, in the patients that are living, of seeing the deaths occur? In the advanced ward they have put screens around the beds when a case is about to die. The question has been asked, Why don't you remove them into another ward? The answer is, It is not

fair to the patient, because they would soon all understand when they went into that ward that that was the last move. If there is any way of overcoming such a situation I would like to have Dr. Knopf give me some information. In his institution he probably has what we have not.

Dr. S. Adolphus Knopf, New York: I think that all this would depend upon the administration of the institution. The first thing necessary in the care of the advanced cases is to have an institution with individual rooms. I would like to call these institutions "hospital-sanatoria," and not hospitals for advanced cases. The pavilion system, with from 8 to 15 beds in each building, even without division, is practicable in early cases, for you rarely have deaths among these. But in institutions for advanced cases, where one would naturally try to spare the patient from witnessing the agonies of the dying, the only possible way to avoid this is to have individual rooms, arranged with thick walls not permitting the transmission of sounds. The body should be removed at night with as little noise as possible, and nurses and employees should be taught to refrain from talking about occurrences of death in the service. If you have advanced cases and you wish to spare, as you say, the unpleasant sight of a dying patient to one who comes there with a more hopeful aspect, you must have separate rooms. That is the only solution. I do not know of any other.

Now, the one thing which I like to impress upon my patients is that they are not to talk about the deaths or about other cases to each other. It depends very largely upon the director, his assistants, and his nurses whether you give to the institution an atmosphere of hope and of cheerfulness, or an atmosphere of indifference and discouragement.

James Jenkins, Jr., Brooklyn, N. Y.: President Lowell, of Harvard, says: "You could no more take up a social problem from one corner than you could pick up a jelly-fish from one corner. You have to get underneath it." We all realize the truth of that in regard to this question of tuberculosis. We all realize that housing conditions affect tuberculosis. We had a very interesting experiment in Brooklyn last year. We conducted a special campaign against the dark interior bedrooms, and found them in the blocks that had the most cases of tuberculosis. We also found that where those conditions were changed, where the houses were gone over from a sanitary standpoint and the dark rooms given air and light, there were no more cases of tuberculosis in those houses right away. I think the most important thing, after all, is that tuberculosis is a disease of poverty. Poverty means bad housing, insufficient nourishment, and lack of those material things that make for decent physical standards; therefore I believe that every tuber-

culosis committee that is going to do anything in its community at all has to fight the question of low wages.

Lee K. Frankel, New York: I could not help regretting, when listening to the admirable report of our Chairman, Mr. Hoffman, that we did not have a system of insurance somewhat similar to the one in Germany. I think the point to be brought out in connection with the German insurance system is that the early reporting of cases can be almost directly traced to this system. Not only have they invalidity insurance, but sickness insurance is practically obligatory on every workman in Germany. This is not a charity, since the workman contributes to the fund out of his weekly wage. The result is that when he becomes ill he takes advantage of its benefits. He presents himself for treatment. And it is due to this that physicians are finding cases of tuberculosis which we do not discover here in the United States. With us, giving up employment means loss of wages. In Germany it does not. The reason so many early cases are found is primarily on account of the insurance system there. We ought to keep that phase of the situation in mind very thoroughly, because I believe that when we can once develop in the United States a system of sickness insurance, we can then better handle the tuberculosis problem. Under the accident insurance scheme which they have in Germany they have cut the number of fatal accidents in two, and have materially reduced the ratio of serious injuries by preventive measures introduced in factories. It is only a question of time until sickness insurance is going to reduce the percentage of sickness, and the cure and prevention of tuberculosis will be taught as they are today teaching the prevention of other diseases.

Sanatorium treatment in Germany has been criticized on account of the high percentage of cures in early cases. In fact, it has been stated that many of these cases are not tuberculosis at all, which accounts for the large percentage of cured and arrested cases. Whatever may be the facts, I feel we ought to record here—and I presume Mr. Hoffman has the data in his paper —the remarkable report recently issued by the Landes-Versicherungsanstalt of the Hansestädte. This report contains the results of fifteen years of treatment in the sanatoria of the Insurance Association, which during the entire period have been under the direction of the same chief physician. All the patients treated in this sanatorium have been reëxamined at intervals of five years subsequent to their discharge, the last reëxamination being made in 1910 of all patients then alive. The report covers over 3000 cases treated, and there are probably no other statistical data at hand today so indicative of the value of sanatorium treatment.

The statistics are as follows:

Year of Treatment	Sex	Number of Patients	Of those Treated there were at the End of 1910				
			a Not Found	b Dead	c Unable to Work	d Fully Able to Work	e Partially Able to Work
1895 ..	Male	37	1	20 = 56%	3 = 8%	13 = 36%	...
	Female	19	1	5 = 28%	1 = 5%	12 = 67%	...
1896 ..	Male	99	5	33 = 35%	5 = 5%	52 = 56%	4 = 4%
	Female	47	3	4 = 9%	1 = 2%	30 = 68%	9 = 21%
1897 ..	Male	117	2	43 = 38%	5 = 4%	62 = 54%	5 = 4%
	Female	91	5	10 = 12%	7 = 8%	51 = 59%	18 = 21%
1898 ..	Male	147	1	64 = 44%	8 = 5%	65 = 45%	9 = 6%
	Female	104	7	23 = 24%	1 = 1%	59 = 61%	14 = 14%
1899 ..	Male	197	9	56 = 30%	13 = 7%	108 = 57%	11 = 6%
	Female	109	8	16 = 16%	5 = 5%	65 = 64%	15 = 15%
1900 ..	Male	164	7	39 = 25%	12 = 8%	84 = 53%	22 = 14%
	Female	132	11	15 = 12%	11 = 9%	69 = 57%	26 = 22%
1901 ..	Male	121	9	30 = 27%	8 = 7%	60 = 54%	14 = 12%
	Female	94	7	14 = 16%	5 = 6%	59 = 68%	9 = 10%
1902 ..	Male	96	5	23 = 25%	8 = 9%	56 = 62%	4 = 4%
	Female	79	6	5 = 7%	8 = 11%	50 = 68%	10 = 14%
1903 ..	Male	56	6	10 = 20%	6 = 12%	26 = 52%	8 = 16%
	Female	41	5	...	3 = 8%	31 = 86%	2 = 6%
1904 ..	Male	61	3	11 = 19%	1 = 2%	40 = 69%	6 = 10%
	Female	55	7	5 = 10%	3 = 6%	34 = 71%	6 = 13%

The Chairman: In this connection I happen to have in my hand a manuscript report from the same institution, covering twenty years' experience. In 1895 the proportion of disability annuities granted to males on account of tuberculosis was 26.7 per cent. of the total, but by 1910 the proportion had been reduced to 14.6 per cent. There is, therefore, conclusive evidence that the preventive and curative efforts provided for by the Hanseatic Invalidity Insurance Institution are resulting in a decided diminution in the frequency of tuberculosis among insured wage-earners.

MISLEADING MORTALITY STATISTICS ON TUBERCULOSIS

By Philip P. Jacobs, Ph.D.
New York

That accurate vital statistics are absolutely necessary to any movement for the betterment of health is simply repeating a truism to which the experience of every anti-tuberculosis worker will bear ample testimony. And to follow this self-evident assertion with a statement to the effect that accurate statistics of the number of deaths from tuberculosis are of fundamental importance in the campaign for the prevention of this disease would be simply stating in general terms the convictions of all who labor in this movement.

But vital statistics, of whatever their nature, whether of deaths, births, marriages, or of living cases of disease, are of little value; indeed, they are pernicious if they are inaccurate. If there is any one place where accuracy is of prime importance it is in the science of statistics. Without accuracy in this department of public health work it is impossible either to secure an adequate idea of the extent and spread of a disease like tuberculosis, or to measure the amount of progress being made in combating it. How frequently, for example, are we called upon to compare the death-rate of one city or group of cities with that of another city or group of cities! Every day the anti-tuberculosis worker has occasion to refer to the number of deaths from tuberculosis in his city or State, and he is constantly asked to compare the rate in his city with that in other cities, European or American. What shall we say, then, if, on careful investigation, we discover there are apparently numerous inaccuracies in the published mortality statistics of many of our American cities and that some of them are of such a nature as to make the reports of these cities of little or no value whatever?

While attempting to compare the death-rates from tuberculosis of some of our American cities two years ago, I discovered, much to my surprise, that there were considerable differences between the number of deaths from this disease in certain cities as reported by the local health authorities and

by the United States Bureau of the Census. In some cases I found that the differences were so marked as to vitiate absolutely any of the reported death-rates for comparative purposes. This led me to look into this matter more carefully, with the result that now, after over two years of study, I feel that, before using the published mortality figures of many of our American cities, great care should be taken to ascertain their accuracy. It is my purpose to show in this paper some of the most striking inaccuracies or differences discovered in this study, and to indicate in a general way some of the possible reasons for these variations. My paper will not be an attempt to explain these differences in detail, but it will be rather an effort to show that such differences do exist.

In order that I might not be accused of selecting certain cities in unfavorable portions of the country to prove a point, I have chosen the cities having a population of 30,000 and over in the States of New York, Massachusetts, Connecticut, New Jersey, Rhode Island, and Maryland. These States, as you will note, are among the oldest registration States in the country, and presumably have the best registration cities. The figures used, moreover, were for the decade 1900 to 1909, thus avoiding the danger of going too far back for data. The figures reported in this paper will be for a group of thirteen cities in Massachusetts and ten cities in New York. The complete report, comprising forty cities, will be given later. The methods in which the data for the investigation were secured will be presented first; a few illustrations of the differences in death-rates next; and, finally, a presentation of the possible reasons for variation.

For the purpose of securing the data for this study, separate and independent blanks were sent to each of the city health boards, and also to the State health board in each State. They were asked to report the total number of deaths from tuberculosis (all forms) for the decade 1900 to 1909 by years. In each case, whether State or local, the figures given were verified by the printed reports where there were any. In addition to these figures, similar data were obtained through the annual reports on mortality statistics, published by the Bureau of the Census only since 1900. All of these data, including the number of deaths for all causes and the number of deaths from tuberculosis, were transferred to cards, the reports from the three sources, United States Census, State Health Board, and Local Health Boards, being arranged side by side for each year. The discrepancies and differences between the three sources of reporting were at once apparent.

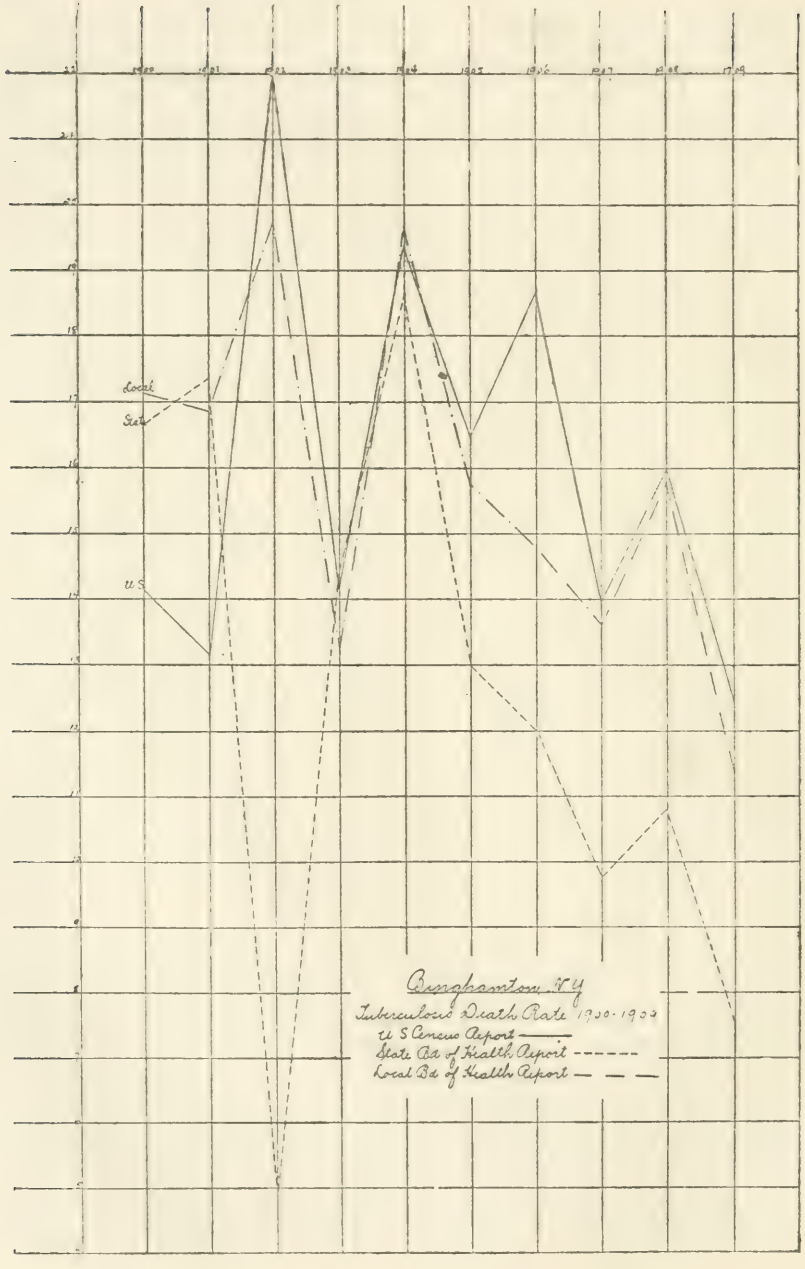
When, however, the death-rates were computed from each source, the differences were much more marked. (The U. S. census population figures

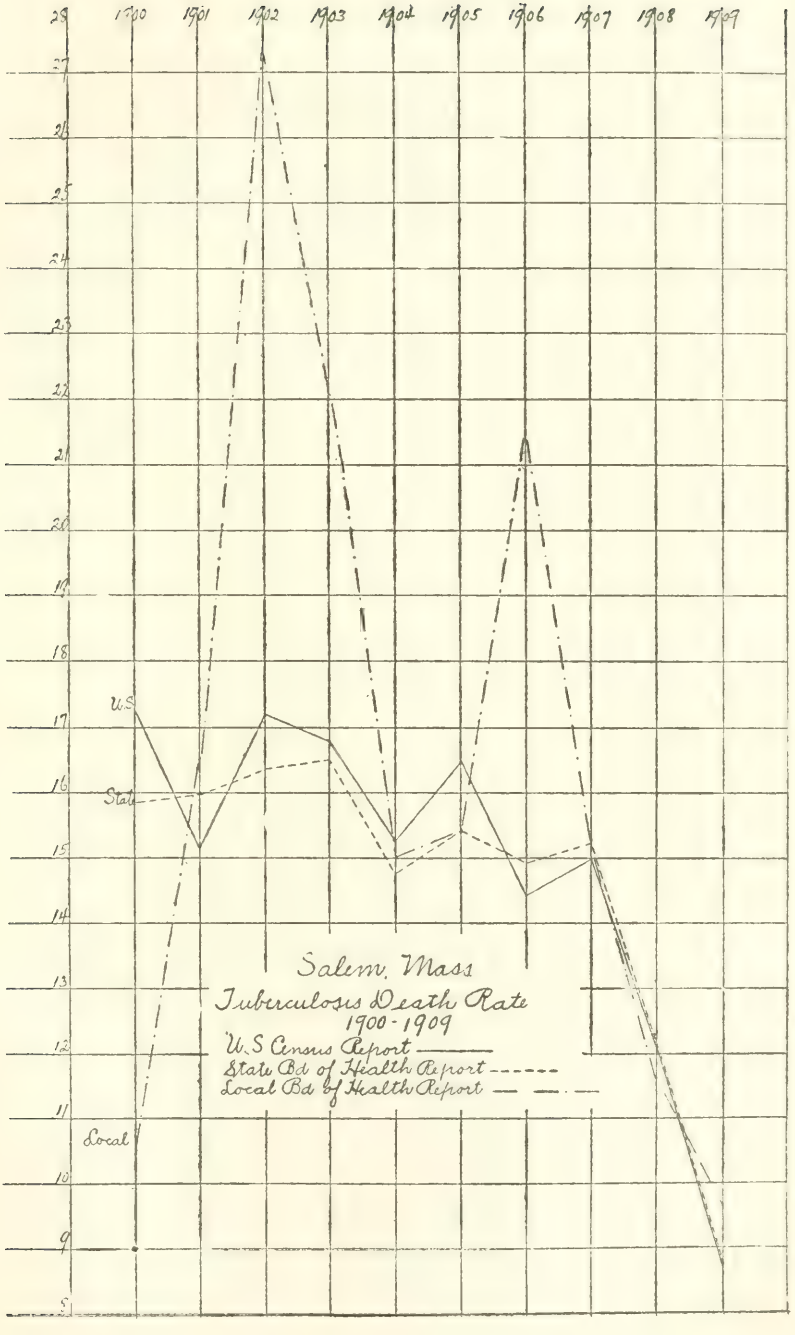
and the arithmetical method of determining the increase in population, used by the Bureau of the Census, were adopted in computing death-rates, corrections being made wherever a population could be obtained in 1905 from a State census.) These death-rates have been plotted for each source for the cities in Massachusetts and New York, and they give some interesting proofs of the misleading character of many of our published mortality figures.

It is significant that in not one of the forty cities for which data have been secured are the figures given by any two of the three sources reporting identical for three consecutive years. The degree of variation is not the same, for in some cases the differences are very slight and superficial, but in others they are so great that it is impossible for any one to determine from them what the true death-rate in such cities in certain years should be without having recourse to the original death certificates. Furthermore, the differences are not constant as to any single source, even in a given city. In one or two instances, as in Boston, for example, the relation of the three sources remains fairly constant. In most of the cities, however, the mortality curves from the three sources for the ten-year period cross each other in almost every conceivable manner. In a given year in a certain city, as in Albany in 1904, the rates from the three sources will be practically identical, while in the very next year the difference will be marked—in this case 21.16 per 10,000 population for the census, 21.67 for the State, and 23.92 for the local authorities. In 1909 the census rate in this same city was 21.15, the State 17.04, and the local 19.44. In Cambridge, Mass., to cite another instance, the rates from the three sources were very nearly the same in 1904, but after that year the local rate declines very rapidly, while the State and census rates go up with even greater rapidity until, in 1909, the census rate is 27.10, the State 27.38, while the local is only 15.48. The accompanying tables and diagrams will illustrate these points.

If we call the average death-rate of the three sources in each year 100 and take the ratios of each of the rates from the various sources in each year to this average, we may see more clearly, perhaps, how serious a matter some of the differences are. In the city of Binghamton, New York, for instance, deviations from the average range all the way from 31.2, or nearly 70 below the average, according to the State figures, to 140.6 in the same year, according to the Census figures. Or take Fall River, Mass., where the deviations from the average range from 88.5 in 1903 according to the census figures to 121.9, according to local figures.

As to the reasons for these apparent differences between the published


Local
State
U S
Binghamton NY
Tuberculous Death Rate 1900-1909
U S Census Report
State Bd of Health Report
Local Bd of Health Report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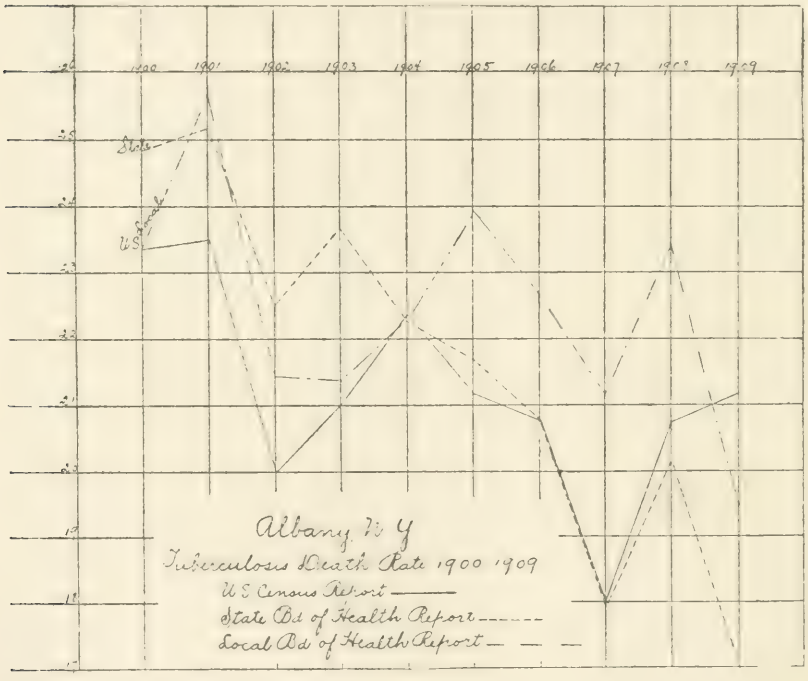
Salem, Mass
Tuberculosis Death Rate
1900-1909
U.S Census Report
State Bd of Health Report
Local Bd of Health Report

death-rates from the various sources, I am unable to state with any degree of exactness. It is my purpose later on to submit to each local health officer the data with regard to his respective city, and to ask him to explain the discrepancies. These explanations, together with similar ones from the State Boards of Health and the Bureau of the Census, should prove the basis for constructive work in the registration of deaths from tuberculosis.

We may, however, at the present time be able to suggest some possible

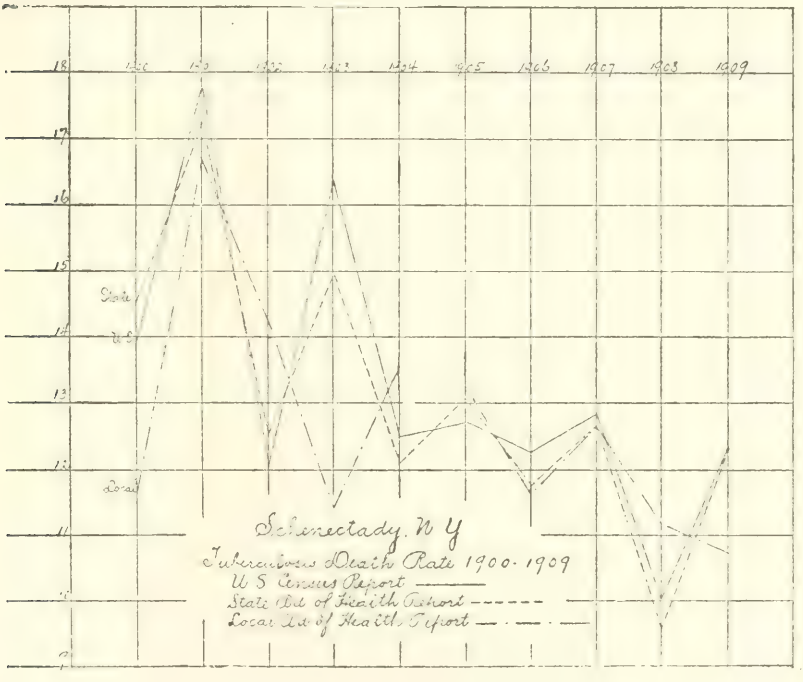


causes for the wide range of differences, without attempting to explain in detail the variations in any particular city.

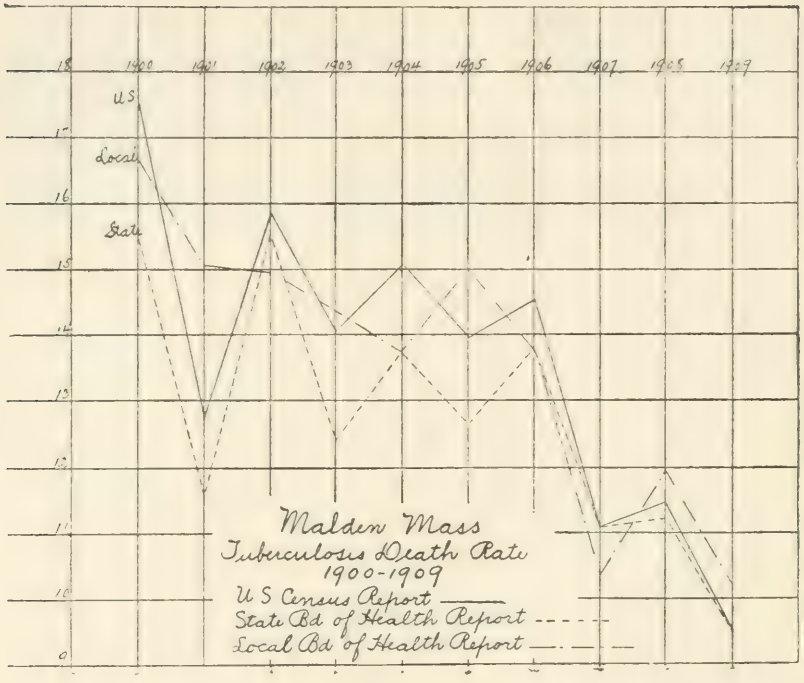
Probably one of the most obvious reasons for differences in reported figures may be grouped under the heading of typographical errors. This cause would seem to account for a number of the minor differences in figures, and in one case at least to one figure of considerable importance. I refer to the death-rate in Binghamton, N. Y., for 1902, which is 4.87 according to the State figures. The number of deaths upon which this figure as given in the yearly report of causes of death is based is evidently a typographical

error, as it does not compare with the sum of the deaths by causes as given in Binghamton according to the monthly reports for 1902 (see pp. 759 and 796, N. Y. S. D. of H. Report, 1902). It is hardly probable that in cases where so many tables are involved some errors of a purely clerical or typographical nature will not creep in.

A second obvious group of causes relates to the methods of classification of the causes of death. The Manual of the International List of Causes of



Death, published by the Bureau of the Census (pp. 58–61), contains a list of over two hundred possible designations of diseases which may be included under some form of tuberculosis. The detailed international list of causes gives eight different causes under Tuberculosis, namely, tuberculosis of the lungs; acute miliary tuberculosis; tuberculous meningitis; abdominal tuberculosis; Pott's disease; white swellings; tuberculosis of other organs; and disseminated tuberculosis. The abridged international list of causes of death condenses these eight causes under three heads, namely, tuberculosis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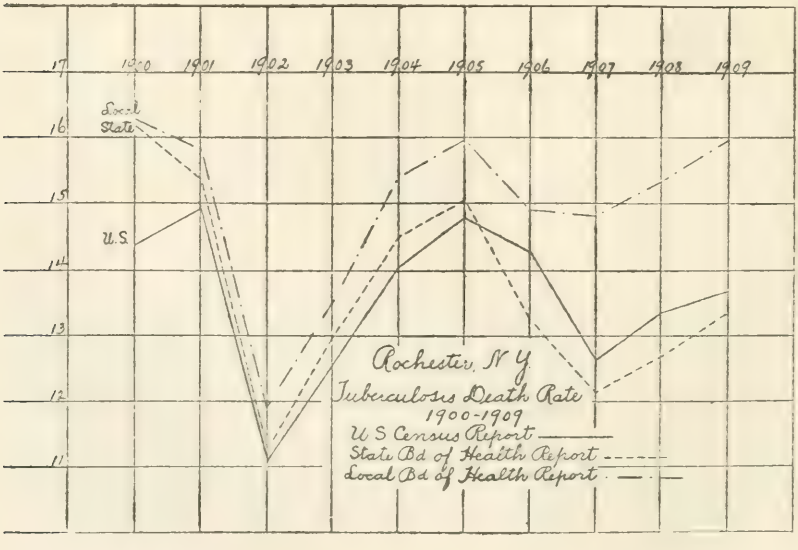
Tuberculosis Death Rate
1900-1909
U S Census Report
State Bd of Health Report
Local Bd of Health Report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Tuberculosis Death Rate
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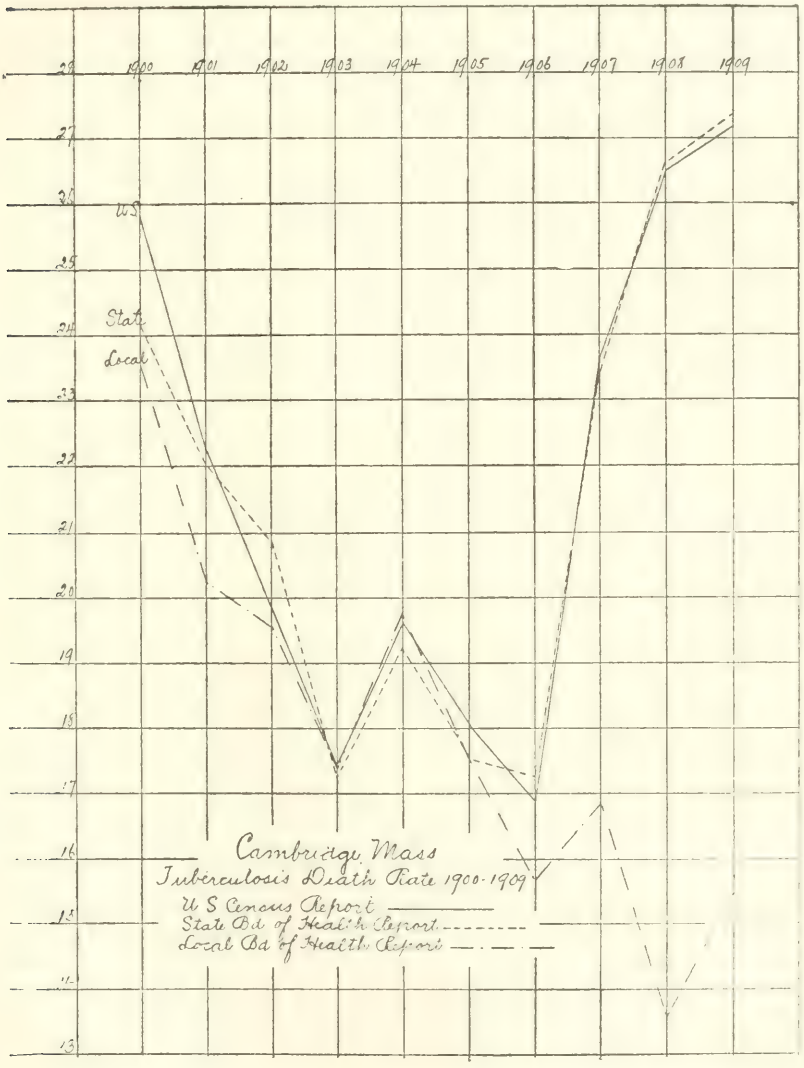
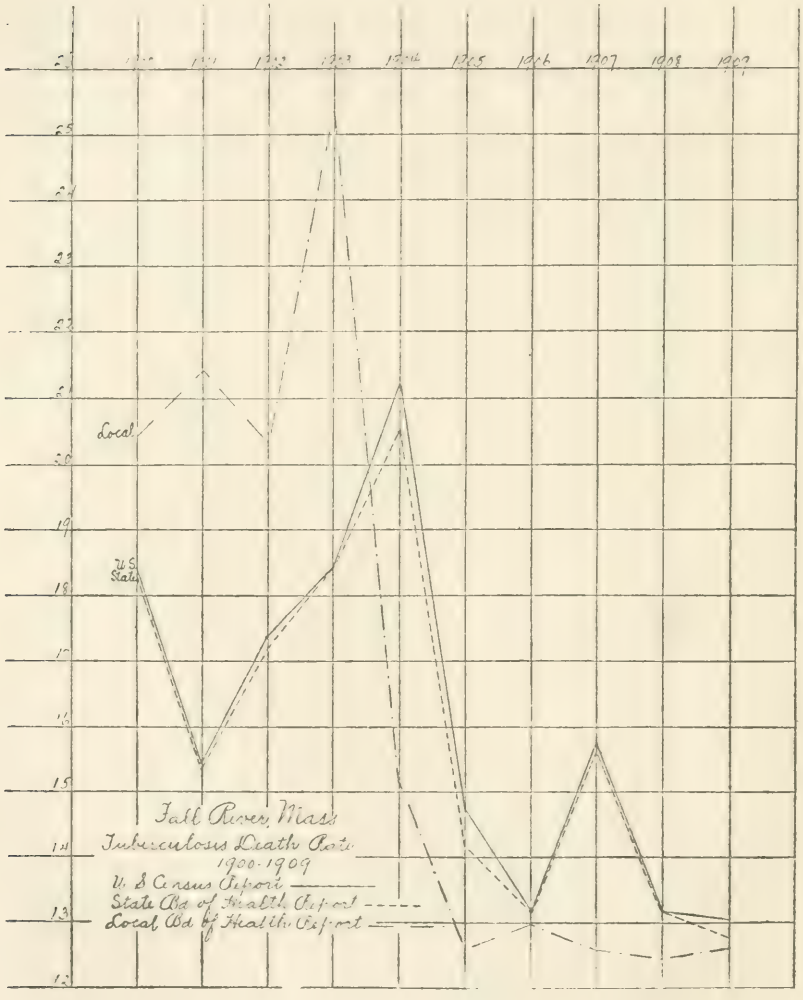
U S Census Report
State Bd of Health Report
Local Bd of Health Report

of the lungs; tuberculous meningitis, and other forms of tuberculosis. This is by far the most common form used in general practice by local health



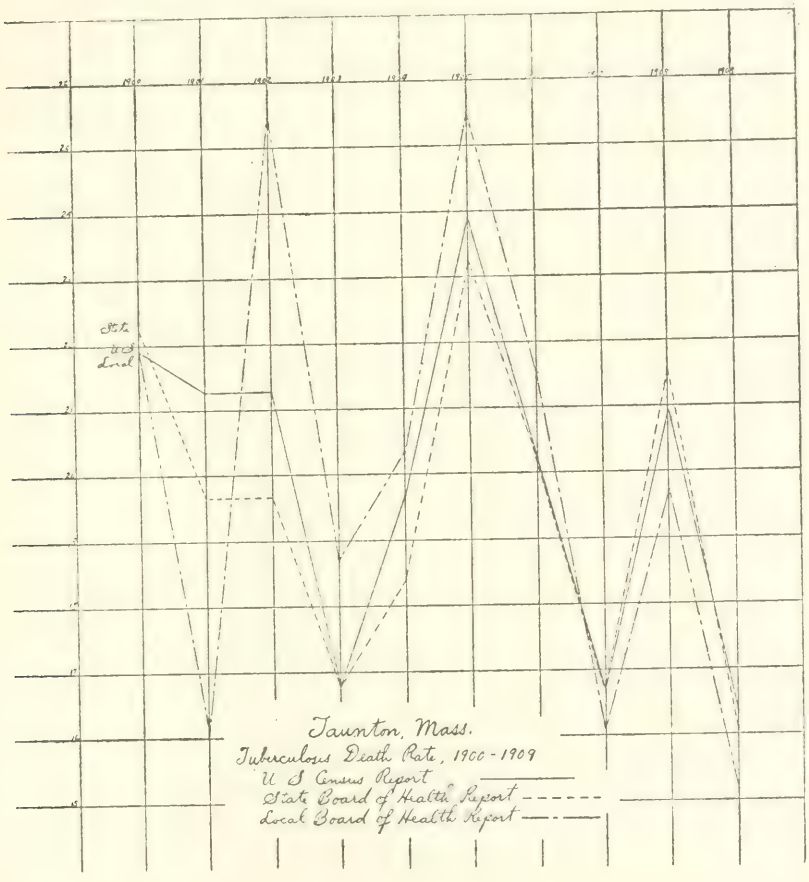
boards, where any attempts to adopt the international classification has been made.

When one takes into consideration the numerous personal factors which enter into the filing of death certificates, it is not remarkable that there



should be a wide range in the classification of causes of death, and that some certificates may be grouped under three or more different heads according

to the number of agencies engaged in the compilation of statistics from them. Thus, for instance, in a pamphlet issued for local registrars by the Bureau of the Census, entitled "Practical Registration Methods," a few of the more common indefinite terms frequently used by physicians in stating causes of

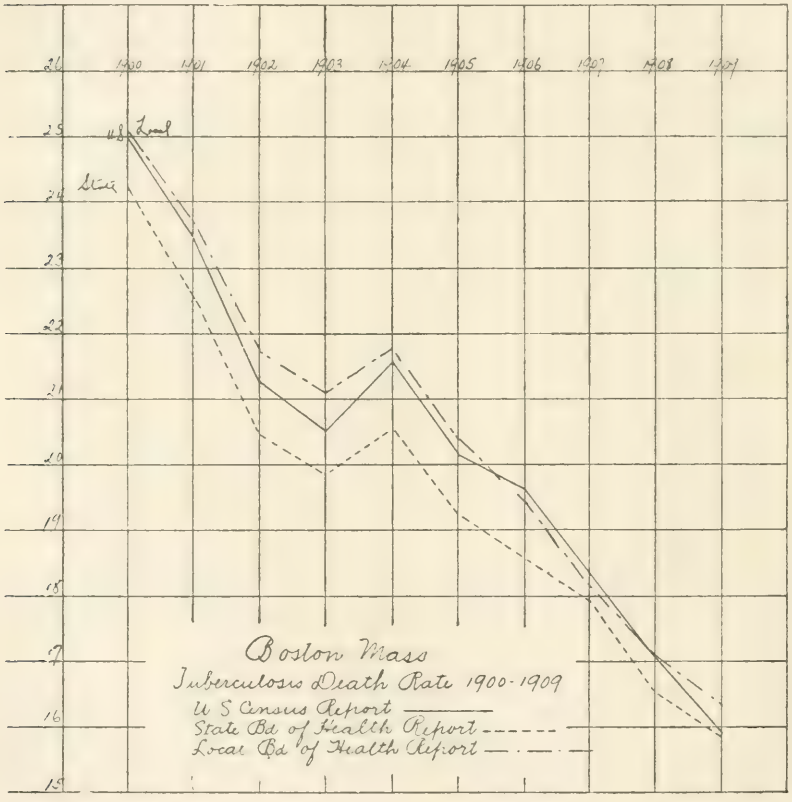

Taunton, Mass.
Tuberculous Death Rate, 1900-1909
U S Census Report
State Board of Health Report
Local Board of Health Report

death are given (p. 17 *et seq.*). A few concrete examples will show at a glance how much must be left to the discretion and judgment of the agency compiling the statistics.

"Bad cold," for example, may be bronchitis, pneumonia, or, more probably, pulmonary tuberculosis. The term "chronic bronchitis," the Census Bureau states, "frequently disguises pulmonary tuberculosis." "Chronic

pneumonia" is used in a similar manner. Such terms as "filling up of lungs," "gradual decay," "hemoptysis," "hemorrhage of lungs," "lung trouble," "scrofula," "meningitis," or "spinal trouble" are frequently used, either intentionally to deceive or through lack of sufficient information, when tuberculosis in some form is meant.

If a local registrar once accepts such a faulty certificate, very little can be



done either by the State Board of Health or the Bureau of the Census to secure the additional information needed, in order that the true cause of death may be properly tabulated. Some efforts are being made to correct these errors, but the lack of funds to carry on the detailed correspondence necessary usually prohibits such action on a large scale. The obvious responsibility lies with the local registrar, who should not accept a faulty cer-

tificate, and who should withhold the burial permit until the proper information is filed. He alone can compel the local physician to state his cause of death accurately.

A third reason for many of the serious differences occurring between the published death-rates of certain cities from the three sources we have mentioned lies in the exclusion or inclusion, as the case may be, of non-residents. The proper method, as adopted by the Bureau of the Census, is to include in the general tables all deaths in the city or district in which they occur. If it is desired to eliminate them, this may be done in special tables or columns or by foot-notes. While I have not attempted to study the various figures with a view to determining where this cause would apply, from general knowledge of local conditions and other information at hand I can readily see where the death-rates in many cities would be seriously affected. For instance, the local figures for Cambridge for the last three years of the decade exclude a considerable number of non-residents, which, had they been included, would have altered the death-rate materially. The local health officer, however, while he mentions the number of deaths from tuberculosis of non-residents in his detailed classification of causes of death, in a table showing comparative death-rates for different years and different diseases (p. 11, 1909–10), excludes these deaths without any mention of the fact. It is undoubtedly true also, from the prima facie evidence in Binghamton, Albany, or Rochester, for example, that the deaths of non-residents have been included in some years in some one or more of the three sources reporting, and that they have been excluded in other years and by other sources. In a city where there is a large State institution or where there are a number of general hospitals, this cause of difference may be very prominent.

Still another obvious reason for differences in the three sources of mortality statistics lies in the varying dates of ending of the fiscal years. The census figures are for the calendar year, and in most cases the State figures are for a similar period. The local years vary, however, considerably. In some cities they coincide with the calendar year and in others they may begin on October 1, March 1, or May 1, in accordance with certain fixed customs or ordinances. This will affect mortality statistics considerably, though not so much as some of the other reasons mentioned.

These are a few of the obvious reasons for the discrepancies we have mentioned. It is equally obvious that uniformity is desirable above everything else in the reporting, registering, and classifying of mortality data, particularly with reference to tuberculosis. The Bureau of the Census, with its limited power and appropriation, is doing everything it can to se-

cure uniformity. Its own mortality statistics are all compiled after uniform methods, and they are, therefore, the most reliable of any published in this country, especially for comparative purposes. Much needs to be done in the way of correcting faulty reports from physicians and faulty records by local and State registrars, and this, too, the Census Bureau and the various State boards of health are undertaking. The permanent Bureau of the Census was established in 1900, and the first manual of the causes of death was issued in 1902. Consequently, the effort to secure uniformity is still in its incipiency.

It is hoped, however, that before the end of another decade mortality statistics in our American cities will be comparable, from whatever source they are taken.

DEATH-RATES FROM TUBERCULOSIS IN NINETEEN MASSACHUSETTS CITIES. COMPUTED FROM THREE SOURCES OF REPORTING: UNITED STATES BUREAU OF THE CENSUS, STATE BOARD OF HEALTH, AND LOCAL BOARDS OF HEALTH: 1900–1909 INCLUSIVE

City	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909
Boston:										
U. S.	24.98	23.44	21.23	20.51	21.58	20.16	19.64	18.37	17.03	15.92
State	24.21	22.56	20.46	19.86	20.56	19.23	18.57	17.93	16.51	15.84
Local	25.09	23.71	21.70	21.10	21.75	20.39	19.41	18.19	17.08	16.35
Brockton:										
U. S.	18.97	15.86	16.45	11.85	12.33	14.02	9.87	8.55	9.95	8.35
State	17.22	16.34	16.92	12.30	11.89	14.02	10.07	7.77	9.76	8.17
Local	19.47	17.06	17.61	14.32	14.92	16.74	11.08	9.91	9.57	8.17
Cambridge:										
U. S.	24.81	22.26	19.87	17.43	19.62	18.06	16.88	23.60	26.50	27.18
State	24.16	22.04	20.19	17.22	19.21	17.55	17.28	23.40	26.60	27.38
Local	22.53	20.22	19.55	17.43	19.73	17.55	15.66	16.83	13.54	15.48
Chelsea:										
U. S.	18.78	17.28	17.53	20.55	22.38	17.70	17.34	16.15	12.79	11.37
State	18.78	17.00	17.82	18.33	20.19	15.55	17.34	16.15	12.21	11.07
Local	19.96	17.28	18.95	18.89	20.74	16.09	18.72	16.15	13.95	12.86
Fall River:										
U. S.	18.41	15.42	17.39	18.41	21.22	14.75	13.18	15.74	13.17	13.03
State	18.31	15.33	17.20	18.50	20.55	14.18	13.18	15.65	13.17	12.78
Local	20.41	21.42	20.43	25.33	15.15	12.58	12.99	12.68	12.45	12.60
Fitchburg:										
U. S.	9.83	12.25	10.89	12.34	10.70	8.78	12.06	13.45	10.02	6.23
State	9.83	11.62	10.89	12.95	10.70	9.09	12.06	12.87	10.02	6.78
Local	10.15	11.94	10.89	12.03	11.00	8.78	11.77	12.87	9.46	6.51
Haverhill:										
U. S.	18.29	23.86	15.76	16.50	16.45	19.03	14.32	15.86	13.70	12.36
State	17.75	23.86	14.16	16.21	16.18	19.03	13.04	16.11	13.22	11.43
Local	17.75	19.84	13.89	14.59	15.92	17.71	14.07	16.11	13.22	12.59

DEATH-RATES FROM TUBERCULOSIS IN NINETEEN MASSACHUSETTS CITIES—(*Continued*)

CITY	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909
Holyoke:										
U. S.	19.91	18.04	16.67	15.34	19.96	16.22	13.39	16.77	15.38	15.30
State	20.13	18.04	16.25	14.72	17.32	14.22	12.62	16.39	15.01	15.30
Local	19.25	18.90	16.46	14.32	21.19	15.92	11.12	16.96	15.01	14.06
Lawrence:										
U. S.	18.70	16.24	17.39	15.66	16.78	16.27	14.87	15.18	13.32	15.83
State	18.54	16.86	16.32	17.45	16.19	15.27	14.75	14.26	13.32	15.95
Local	18.22	17.16	17.20	17.60	17.07	16.84	14.61	15.44	15.83	18.61
Lowell:										
U. S.	19.27	16.64	16.43	13.59	14.12	15.39	15.43	15.46	12.18	12.01
State	19.06	16.85	16.22	13.06	13.28	15.60	14.71	15.46	12.28	12.11
Local	19.59	17.90	17.27	13.91	13.17	15.39	15.23	15.46	11.69	12.49
Lynn:										
U. S.	19.27	14.67	13.63	12.49	19.38	13.24	9.68	14.15	13.03	11.05
State	18.68	14.10	13.35	11.82	18.19	12.85	9.68	14.03	12.79	11.28
Local	18.83	16.38	14.32	12.09	17.92	13.50	9.93	13.90	13.03	11.16
Malden:										
U. S.	17.53	12.74	15.81	14.05	15.07	13.93	14.50	11.09	11.46	9.50
State	15.45	11.58	15.53	12.40	13.72	12.62	13.73	11.09	11.22	9.50
Local	16.64	15.06	14.97	14.33	13.72	14.99	13.73	10.35	11.94	10.20
New Bedford:										
U. S.	16.98	21.75	18.15	18.11	20.98	15.87	16.49	15.37	13.44	12.90
State	16.98	21.44	16.96	17.96	18.90	16.00	16.61	15.85	13.56	13.55
Local	16.18	21.44	17.26	16.81	19.03	16.41	15.73	15.97	14.13	13.44
Newton:										
U. S.	10.42	10.52	9.17	7.04	10.50	8.42	6.41	7.36	7.76	6.63
State	11.31	12.56	8.31	6.47	9.67	8.15	6.68	7.10	8.02	6.63
Local	10.12	12.85	9.75	6.47	9.12	7.60	5.87	6.83	7.25	6.37
Salem:										
U. S.	17.24	15.16	17.20	16.78	15.28	16.48	14.41	14.97	12.05	8.70
State	15.85	15.98	16.38	16.51	14.75	15.41	14.93	15.22	12.05	8.70
Local	10.57	16.53	27.30	22.19	15.02	15.41	21.49	15.22	11.63	9.65
Somerville:										
U. S.	16.87	14.56	17.00	12.38	13.88	10.97	12.84	11.86	9.99	10.04
State	16.71	14.09	16.38	12.08	13.14	11.12	12.70	11.45	9.99	9.91
Local	16.55	14.56	15.92	12.38	13.88	12.13	13.40	11.86	9.61	10.17
Springfield:										
U. S.	15.95	16.63	13.95	14.36	14.18	11.97	11.74	11.54	9.42	10.94
State	16.44	16.47	13.65	14.07	13.05	11.69	12.13	11.16	9.08	10.83
Local	15.63	15.69	13.05	16.53	15.16	12.51	12.26	12.17	8.57	10.60
Taunton:										
U. S.	21.91	21.27	21.28	16.78	19.69	23.90	20.23	16.72	20.94	16.36
State	22.23	19.66	19.67	16.78	18.40	23.25	20.23	16.72	21.55	16.07
Local	21.91	16.12	25.48	18.71	20.34	25.51	21.50	16.10	19.73	15.17
Worcester:										
U. S.	20.60	19.19	16.52	17.06	16.80	17.17	15.48	15.00	15.05	11.86
State	20.77	18.69	15.78	16.58	15.77	16.62	15.33	14.26	14.76	11.86
Local	21.11	19.94	17.01	17.14	16.25	17.79	14.88	13.82	14.76	12.28

DEATH-RATES FROM TUBERCULOSIS IN TEN NEW YORK CITIES. COMPUTED FROM THREE SOURCES OF REPORTING: UNITED STATES BUREAU OF THE CENSUS, STATE BOARD OF HEALTH, AND LOCAL BOARDS OF HEALTH: 1900–1909 INCLUSIVE

City	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909
Albany:										
U. S.	23.37	23.50	19.98	20.97	22.35	21.16	20.75	17.99	20.70	21.15
State	24.53	25.18	22.50	23.66	22.25	21.67	20.65	17.91	21.15	17.04
Local	23.37	25.61	21.44	21.38	22.25	23.92	22.68	21.15	23.36	19.44
Auburn:										
U. S.	15.82	13.32	9.29	18.01	15.27	11.99	16.08	13.18	14.19	10.80
State	17.13	13.96	10.57	18.00	14.64	12.91	15.77	12.28	14.19	9.93
Local	17.46	14.94	10.57	17.37	16.51	11.68	15.77	13.18	13.90	10.80
Binghamton:										
U. S.	14.12	13.14	21.94	14.14	19.34	16.47	17.66	13.92	15.98	12.45
State	16.64	17.35	4.87	14.38	18.62	12.99	12.00	9.72	10.79	7.59
Local	17.15	16.85	19.74	13.18	19.57	15.77	14.79	12.60	15.76	11.39
Buffalo:										
U. S.	11.32	12.68	11.76	12.20	13.57	13.00	12.55	12.38	12.79	12.79
State	12.11	13.32	12.61	12.83	12.39	12.81	12.83	12.53	12.98	12.62
Local	12.00	13.18	12.45	12.83	13.81	12.81	12.83	12.56	13.08	12.62
Elmira:										
U. S.	12.90	12.05	14.57	11.20	12.04	13.72	13.32	13.22	9.29	10.30
State	14.29	14.29	15.40	10.64	11.20	14.27	13.05	12.67	9.01	9.21
Local	15.13	14.85	16.25	11.20	13.16	13.15	13.32	12.39	10.11	9.75
New York City:										
U. S.	24.20	22.88	20.78	21.16	22.04	21.11	21.49	20.68	19.77	18.67
State	23.74	22.93	20.72	21.64	21.90	21.31	21.60	20.88	19.87	18.73
Local	23.72	22.91	20.67	21.19	21.59	21.33	21.55	20.89	19.88	18.73
Rochester:										
U. S.	14.39	14.92	11.06	12.56	14.05	14.78	14.29	12.62	13.35	13.65
State	16.17	15.39	11.24	12.96	14.50	15.05	13.26	12.16	12.66	13.36
Local	16.29	15.81	11.88	13.48	15.40	15.98	14.90	14.81	15.31	15.97
Schenectady:										
U. S.	13.89	17.80	12.10	16.34	12.48	12.71	12.26	12.80	10.00	12.30
State	14.51	17.23	12.52	14.96	12.10	13.05	11.77	12.64	9.55	12.30
Local	11.67	16.67	14.22	11.41	13.55	13.22	11.61	12.64	11.19	10.72
Syracuse:										
U. S.	15.78	15.89	11.80	13.11	14.65	12.04	12.05	11.90	11.99	11.18
State	15.87	16.07	11.88	12.49	14.90	12.46	11.30	11.82	11.91	10.88
Local	15.59	16.52	11.17	12.93	14.73	13.31	11.88	11.50	11.84	11.03
Yonkers:										
U. S.	17.32	20.15	16.13	20.35	19.59	17.59	16.43	13.23	16.15	14.18
State	15.80	19.94	16.31	21.06	19.24	17.91	17.05	12.36	16.01	14.05
Local	16.47	18.17	17.44	21.96	18.73	16.25	16.28	12.79	16.56	14.58

DEATHS FROM TUBERCULOSIS IN NINETEEN MASSACHUSETTS CITIES, ARRANGED ACCORDING TO THREE SOURCES OF REPORTING: UNITED STATES BUREAU OF THE CENSUS, STATE BOARD OF HEALTH, AND LOCAL BOARDS OF HEALTH: 1900–1909 INCLUSIVE

City	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909
Boston:										
U. S.	1,400	1,331	1,220	1,193	1,270	1,200	1,199	1,149	1,091	1,044
State	1,358	1,281	1,176	1,155	1,210	1,145	1,134	1,122	1,058	1,039
Local	1,407	1,346	1,247	1,227	1,280	1,224	1,185	1,138	1,094	1,072
Brockton:										
U. S.	76	66	71	53	57	67	49	44	53	46
State	69	68	73	55	55	67	50	40	52	45
Local	78	71	76	64	69	80	55	51	51	45
Cambridge:										
U. S.	228	207	187	166	189	176	168	237	270	281
State	222	205	190	164	185	171	171	235	271	283
Local	207	188	184	166	190	171	156	169	138	160
Chelsea:										
U. S.	64	60	62	74	82	66	63	57	44	38
State	63	59	63	66	74	58	63	57	42	37
Local	68	60	67	68	76	60	68	57	48	43
Fall River:										
U. S.	193	162	183	194	224	156	147	175	150	152
State	192	161	182	195	217	150	147	174	150	149
Local	214	225	215	267	160	133	141	151	142	147
Fitchburg:										
U. S.	31	39	35	40	35	29	41	47	36	23
State	31	37	35	42	35	30	41	45	36	25
Local	32	38	35	39	36	29	40	45	34	24
Haverhill:										
U. S.	68	89	59	62	62	72	56	64	57	53
State	66	89	53	61	61	72	51	65	55	49
Local	66	74	52	55	60	67	55	65	55	54
Holyoke:										
U. S.	91	84	79	74	98	81	69	89	84	86
State	92	84	77	71	85	71	67	87	82	86
Local	88	88	78	69	104	79	59	90	82	79
Lawrence:										
U. S.	117	104	114	105	115	114	109	116	106	131
State	116	108	107	117	111	107	108	109	106	132
Local	114	110	113	118	117	118	107	118	126	154
Lowell:										
U. S.	183	158	156	129	134	146	150	153	124	125
State	181	160	154	124	126	148	143	153	125	126
Local	186	170	164	132	125	146	148	153	119	130
Lynn:										
U. S.	132	103	98	92	146	102	77	116	110	96
State	128	99	96	87	137	99	77	115	108	98
Local	129	115	103	89	135	104	79	114	110	97
Malden:										
U. S.	59	44	56	51	56	53	57	45	48	41
State	52	40	55	45	51	48	54	45	47	41
Local	56	52	53	52	51	57	54	42	50	44

DEATHS FROM TUBERCULOSIS IN NINETEEN MASSACHUSETTS CITIES—(*Continued*)

CITY	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909
New Bedford:										
U. S.	106	141	122	126	151	118	130	128	118	119
State	106	139	114	125	136	119	131	132	119	125
Local	101	139	116	117	137	122	124	133	124	124
Newton:										
U. S.	35	36	32	25	38	31	24	28	30	26
State	38	43	29	23	35	30	25	27	31	26
Local	34	44	34	23	33	28	22	26	28	25
Salem:										
U. S.	62	55	63	62	57	62	56	60	50	37
State	57	58	60	61	55	58	58	61	50	37
Local	38	60	100	82	56	58	83	61	48	41
Somerville:										
U. S.	104	92	110	82	94	76	91	86	74	76
State	103	89	106	80	89	77	90	83	74	75
Local	102	92	103	82	94	84	95	86	71	77
Springfield:										
U. S.	99	107	93	99	101	88	90	92	77	94
State	102	106	91	97	93	86	93	89	76	93
Local	97	101	87	114	108	92	94	97	71	91
Taunton:										
U. S.	68	66	66	52	61	74	64	54	69	55
State	69	61	61	52	57	72	64	54	71	54
Local	68	50	79	58	63	79	68	52	65	51
Worcester:										
U. S.	244	231	202	212	212	220	204	203	209	169
State	246	225	193	206	199	213	202	193	205	169
Local	250	240	208	213	205	228	196	187	205	175

DEATHS FROM TUBERCULOSIS IN TEN NEW YORK CITIES. ARRANGED ACCORDING TO THREE SOURCES OF REPORTING: UNITED STATES BUREAU OF THE CENSUS, STATE BOARD OF HEALTH, AND LOCAL BOARDS OF HEALTH: 1900–1909 INCLUSIVE

CITY	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909
Albany:										
U. S.	220	223	191	202	217	207	204	178	207	168
State	231	239	215	228	216	212	203	177	210	170
Local	220	243	207	221	216	234	223	209	232	194
Auburn:										
U. S.	48	41	29	57	49	39	53	44	48	37
State	52	43	33	57	47	42	52	41	48	34
Local	53	46	33	55	53	38	52	44	47	37
Binghamton:										
U. S.	56	53	90	59	82	71	78	63	74	59
State	66	70	20	60	79	56	53	44	50	36
Local	68	68	81	55	83	68	66	57	73	54

DEATHS FROM TUBERCULOSIS IN TEN NEW YORK CITIES—(*Continued*)

CITY	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909
Buffalo:										
U. S.	399	453	426	448	505	490	485	490	518	530
State	427	476	457	471	461	483	496	496	526	523
Local	423	471	451	471	514	483	496	497	530	523
Elmira:										
U. S.	46	43	52	40	43	49	48	48	34	38
State	51	51	55	38	40	51	47	46	33	34
Local	54	53	58	40	47	47	48	45	37	36
New York City:										
U. S.	8,316	8,121	7,610	7,990	8,570	8,445	8,927	8,909	8,819	8,616
State	8,162	8,141	7,589	7,990	8,516	8,528	8,976	8,996	8,867	8,645
Local	8,154	8,135	7,571	8,001	8,495	8,535	8,955	8,999	8,869	8,643
Rochester:										
U. S.	234	248	188	218	249	269	270	248	272	288
State	263	256	191	225	257	274	251	239	258	282
Local	265	263	202	234	273	291	282	291	312	337
Schenectady:										
U. S.	44	63	57	83	68	74	75	82	67	86
State	46	61	59	76	66	76	72	81	64	86
Local	37	59	67	58	74	77	71	81	75	75
Syracuse:										
U. S.	171	175	132	149	169	141	146	149	155	149
State	172	177	133	142	172	146	138	148	154	145
Local	169	182	125	147	170	156	144	144	153	147
Yonkers:										
U. S.	83	102	86	114	115	108	107	91	117	108
State	71	101	87	118	113	110	103	85	116	107
Local	79	92	93	123	110	106	113	88	120	111

DISCUSSION ON PAPER BY DR. JACOBS

Dr. Cressy L. Wilbur, Washington, D. C.: I did not hear the entire paper as read by Dr. Jacobs, but I have had some little correspondence with him, and know something of the figures presented. I listened with very much interest, indeed, and I believe that this matter of the agreement of the official mortality statistics as published by the Federal Government, by the States, and by the cities—the local figures—is of fundamental importance for the progress of sanitation in this country. These differences are annoying, the discrepancies are perplexing, and persons who are not familiar with statistical matters may be utterly baffled in their efforts to ascertain the true facts in regard to the prevalence of the various causes of death.

I appreciate very much the statement made in regard to the general reliability of the census rates, but it must be remembered that the census rates are based on transcripts of the original returns made by the local or by

the State officials, and if those transcripts are not absolutely correct, there is then a possibility of error in the census rates.

In regard to the various sources of difference, I might give a very long list in comparing, for instance, the published death-rates from tuberculosis or from all causes in the census reports on mortality statistics with the State reports and with the local reports. I shall refer to only a few of them, and at some later time will give a more exhaustive list.

In the first place, the question of population must be considered. The census estimates of population are based upon a uniform method, and for all years which are not census years the populations are necessarily estimated. In some State reports this is done; in others it is not done. Sometimes the estimate is made according to the geometrical method, sometimes according to the arithmetical, and sometimes according to various other methods, so that, unless you have a uniform basis of estimating population, your rates are apt to vary.

The second, and perhaps the most important, difference may arise from the statement of deaths. Now, it might seem that it would be a very easy thing to get a statement of the total number of deaths that would agree exactly in the local, State, and census figures, but, as a matter of fact, if the three series be compared, there will be found some quite startling differences. This may arise, perhaps, from carelessness in the transcribers. The census has invariably in recent years required a certified statement—practically an official declaration—of the correctness of the returns made from the offices from which transcripts are received. They are made by months. If there is any discrepancy whatever in the statements, we send them back, and the matter is reconciled before we go any further. But it is evident that this cannot go into differences of compilation of the individual causes of death. The compilation of causes of death is a difficult matter. It requires constant judgment, some professional knowledge, and it must be done on a uniform basis from year to year, otherwise the results cannot be comparable. One of the chief merits of the annual compilations presented by the Bureau of the Census is that they are done according to a uniform method for the entire series of years covered by the reports, that is, the annual reports beginning in 1900. They are conducted according to the method of compilation recognized by the international classification, and similar principles are in use in all national registration offices. There are even then some personal factors, some individual equations, which may perhaps lead to slightly different results in the compilation of a large mass of returns, but there should be no very marked difference.

Now, it has been evidently impossible up to the present time to train all the local officials in the States and cities so that they will make such intricate compilations and secure absolutely identical results. I do not know that it will ever be possible to secure absolute identity in these three compilations, and I believe in compilations in other cases where large masses of returns are compiled in different offices there will necessarily be some differences. However, it is a comparatively small difference that would result from the difficulties of classifying the causes of death. The most marked differences will result from the exclusion of certain classes of returns, as, for instance, the deaths of non-residents. Dr. Jacobs has spoken of that matter, and our uniform practice in this respect, approved by the Section on Vital Statistics of the American Public Health Association, is to include all deaths. Then, if a supplementary table is necessary, that may be presented. But it would be evidently unfair to take the reports of a local office that did not include all deaths, but excluded certain classes of non-residents, and compare the rates based on such a compilation with the rates of the State or of the census, which included all deaths. I think this matter is of sufficient importance that a very thorough investigation should be made, and I hope it may be the pleasure of this Association perhaps to appoint a committee to study further the situation and to present such recommendations for the improvement of this condition as may be found necessary, and in this purpose I need not say that the Bureau of the Census will most heartily cooperate.

Dr. Charles R. Grandy, Norfolk, Va.: There is another source of error which I think the Association should take cognizance of in looking into the matter of statistics, and that is the matter of the falsification of death certificates in cases of tuberculosis. I believe there are still a very large number of deaths from tuberculosis reported as due to other causes. I happened to run down some of those last year. There were seventeen deaths in my town among the negroes reported as being due to malarial fever. I happened to have known that two of the cases reported as malarial fever had had large cavities in both lungs before they came into the hands of this colored physician. Practically all the deaths reported as due to malarial fever were reported by one colored physician, who was doing it, as he thought, to save his patients their insurance and incidentally his fees. The practice was stopped by a little publicity and getting the business men's organization back of it, as this is a way of advertising a city as having malarial fever when it was really due to a physician falsifying returns to collect his fees. The man stopped, and it has cut off all the deaths from malarial fever this year.

There were really no deaths from malarial fever at the time, as there is very little malarial fever there, and the negroes do not die from it. When we begin to get our southern certificates turned into the Census Bureau we will have to get the local registrars to be more careful to weed out the false ones, which reduce the number of deaths from tuberculosis.

Dr. W. W. Tompkins, Charleston, W. Va.: I should like to ask a question. If a case comes to you who is, for instance, moderately advanced with tuberculosis, and on examination of the urine you also find that he has diabetes, and the case drags along and finally dies, how would you give the explanation in making out the report as to what brought about the death? Would you state that he died from tuberculosis, or would you state that the case died from diabetes, or would you simply give it as a complication? Take, for instance, a moderately developed case of tuberculosis. It goes along very well, and then suddenly develops acute lobar pneumonia and dies. How do you make out your report there? How are you going to exclude one and mention the other, or in what way would you make it appear what killed the patient?

The Chairman: The answer to this question is very simple. We do not, in the United States, make use of the method which has been employed in the city of Budapest for many years, and which is known as the Budapest System of Death Classification. Under our present method of uniform death classification we must of necessity adopt a more or less arbitrary rule. There may be three, or even more, contributory causes of death mentioned on the certificate, but a choice must be made of one for statistical purposes of classification under the present system. Under the Budapest system of multiform death classification the facts are quite accurately shown, in that, by means of a comparatively simple analysis, the several causes of death are shown in their relation to each other. I brought this subject to the attention of the American Public Health Association three or four years ago, but I am not aware of any serious attempt having been made to introduce the system in this country on the part of the Federal Government or any one of the States or municipalities. In brief, under the Budapest system of death classification the collateral or contributory causes of death are precisely exhibited in the tabular analysis, and if, for instance, an accident is complicated by tuberculosis, or a case of heart disease by some disease of the urinary system, the facts are precisely established by means of the Budapest system. I most urgently suggest the serious consideration of this question, than which there is hardly one of greater practical importance in the field of vital statistics at the present time.

THE VISITING NURSE AND TUBERCULOSIS CONTROL

By Miss Lillian Wald
New York

As every fresh advance from point to point has been made in combating tuberculosis, from hospital accommodation for advanced cases to sanatoria for early cases, to outdoor life and suitable occupation for incipients, to open-air schools and preventoria for delicate predisposed children, with every fresh point taken, the need of close personal individual care and supervision is demonstrated. In nursing and management, in manual service and teaching, admonition based on the latest word of science, personal care becomes obviously the indispensable organ of executive control. Even large collective control asserted in a broad and far-reaching way, through social legislation as it may be enacted in the future, will never be possible except as administered and wielded by individuals. At the starting-point of every possible avenue of danger of infection or breaking down of human strength there will always be the home, the family, its surroundings, its work- and play-places, its heredity, and its degree of intelligence to be watched and guarded.

Every possible method of tuberculosis control comes back finally to this foundation and center of control.

The nurse has been trained for this service. No other agent has as yet been found so useful as she in exerting this intimate control. The writer looks over the field of her employment and finds amazing growth in the appreciation of the advantage of using her in the campaign against tuberculosis.

Twenty years ago there were not more than twenty graduate nurses at work in the homes of the people. It is only eight or nine years since the first nurse was appointed distinctly for the care of the tuberculous, one whose sole and single task was to look up the patients who were "lost" from a large dispensary (the Johns Hopkins of Baltimore).

Today there are nearly 3000 nurses, almost all of whom are engaged

indirectly in this campaign, and about 500 who are working exclusively for tuberculosis associations.

That this convention may have the record, Miss Y. G. Waters has compiled the statistics which up to May 6, 1912, are as follows:

952 Associations of various kinds, employing 2809 nurses. These include charity organization societies, churches, departments of health, departments of education, dispensaries, Metropolitan Life Insurance Company, hospitals, tuberculosis clinics, factories, shops, State boards of health, and others.
4 State Associations employing 118 nurses.
78 Municipalities employing 861 nurses.
16 Municipalities (in addition to above) subsidized by outside agencies employing 24 nurses.
289 General Visiting Nurse Associations employing 894 nurses for tuberculosis work.

The State of Pennsylvania has a complete system of tuberculosis dispensaries in every county, and in conjunction with them a staff of nurses equally State-wide.

The Metropolitan Life Insurance Company provides the visiting nurse for its industrial policy-holders, and in a period of three years since the service was established by them they have extended it from one visiting nurse association which answered calls of their sick policy-holders in one community to 451 centers, taking in altogether 981 cities and towns.

The American National Red Cross is about to inaugurate a service of visiting nursing in rural communities, hitherto neglected in this respect. Directed by a special committee of this effective organization, many communities not in the registered area and remote from the centers of active social propaganda will be given stimulus to organize for nursing, and from this other medical and social measures will inevitably grow.

Those familiar with the plans of the new venture of the National Red Cross predict expert administration from it, and in this addition to its functions a new value to the honored society. It requires no great stretch of the imagination to visualize the time, not far distant, when our country will be districted from the northernmost point to the southernmost with the graduate nurse entering the homes wherever there is illness, caring for the sick, preaching the gospel of health, and teaching in simplest form the essentials of hygiene.

Even though all these nurses are not to be engaged exclusively for tuberculosis, they are developing a nation-wide education in personal and do-

mestic hygiene at the most essential point—the home—and utilizing for their patients the medical and social resources existing in their communities, interpreting legislation concerning health and sanitary control, and translating into simplest terms the scientific pronouncements of experts.

There is, however, in the minds of some of these nurses who have been most active in the extension of visiting nursing no little anxiety lest the value of their magnificent opportunity be diminished through faulty administrative regulations that affect the very heart of this service.

In many of the tuberculosis associations there is a tendency to make the nurse's visits purely inspectorial and academic in their education. The writer would strongly emphasize her protest against diminishing the effect of the nurse by withdrawing from her the actual bedside ministration when her patients are in need of such. Her position is one of privilege, and, in fact, her reputation in her district is based largely upon the gratitude felt for one who relieves pain and suffering in the time of need. No other visitor can ever quite reach this position. Even if her social spirit be ardent and her sympathy electric, it is only the most exceptional nurse who can substitute good council and friendly solicitation for the only service that seems "actual" to people who are ill.

I venture to emphasize this because of much discussion upon the subject and the tendency on the part of highly organized tuberculosis associations to lose sight not only of the value of the point I would make, but of the psychology of the nurse herself. Nurses are liable to become mechanical, as are all other people, in a routine that shows no definite concrete effect. The heat of moral zeal cools with the reiteration of formulæ that must often seem impertinent in the face of uncontrollable causes. Even two patients among the day's cases who really need nursing would keep alive in the heart of the nurse the knowledge of her fine heritage of ministration, and giving relief to them would bring satisfaction to her as well.

Professor Winslow said: "The Visiting Nurse is the most important figure in the modern movement for protecting public health."

I hardly think the battle against tuberculosis can be successfully waged without her, but to get her best value, standards are needed for the organization and for her. Some of the work actually done today by nurses under a faulty system that does not demand from them more than routine could probably be often carried out by a clerk or a high-school graduate or a friendly visitor. It is easy to learn to give routine instruction—a very responsible position and a difficult one to insure the actual carrying out of these instructions by teaching, by demonstration, by giving the bath and care

when necessary, by the management of danger-points, by the regulation of family life, etc.

Committees and boards are apt to permit the nurses, indeed to authorize them, to work too hurriedly. They sometimes even forbid the nurses to do nursing, limiting their services to reports and oral instruction. Territories are too large.

Nurses who have had visions of their call to public health movements are likely to keep the real character of their work in prominent view. We still need sentiment and always shall in our contact with the sick, for here a strictly impersonal attitude is a dangerous one, and from it the nurse is preserved by the nature of her ministrations.

The writer realizes that many of the tuberculosis cases are ambulant and that comparatively few can be found in their beds by the visiting nurse. Nevertheless, the divorcing of the instructive from bedside nursing brings about a situation disadvantageous enough to have those engaged in tuberculosis work give it serious consideration.

The Tuberculosis Nurses' Division of the Health Department of Baltimore exemplifies a successful service where the nurses care for the bedridden as well as the ambulant cases in their districts. Many instances might be cited where good preventive tuberculosis work has been accomplished by the nurse, though that was not the primary purpose in employing her. Her persuasiveness many times induces further investigation into physical conditions. One commercial company introduced a visiting nurse department, and reports that the nurse picked out thirty-two men who "looked unhealthy." On medical examination, sixteen of these were found to have tuberculosis.

The average nurses need something over and above the training given in the schools. They are not properly prepared in sufficient numbers to meet all the demands made upon and for them. The training schools might well add to their curricula instruction in matters which come up in the care of the tuberculous. Until such time as the schools recognize that they are educational centers for other than private nursing and institutional work, postgraduate specialized training should be secured for nurses. To meet this need, the Department of "Nursing and Health" has been established at Teachers' College.

Leading up to further intelligence on this subject, the American Association of Superintendents of Training Schools and the American Association of Nurses composed of the Alumnæ Associations, recently appointed a com-

mittee to report back to them upon the standardizing of visiting nursing. This standardization is more especially needed in tuberculosis work.

The nurses who have been most efficient have acquired by experience knowledge on a great variety of subjects related to the question of tuberculosis control, and have developed some technic for this specialty.

First—the consideration of the patient as an individual involving the treatment prescribed, which in turn includes medical care, proper diet, suitable occupation, outdoor sleeping arrangement, eleemosynary aid, building up a confidence in the treatment, questions of quackery, the establishment of a daily routine that is practicable, etc., etc.—points unnecessary to elaborate at this place. The patient as an individual brings in all of the factors which have been enumerated at this Congress, excepting perhaps that of general legislation.

Second—the consideration of the patient as a member of the family, which both modifies and enlarges the consideration of the individual, and

Third—the consideration of the patient as a member of the community, which is the broadest point of view, and the one about which social workers, medical and lay, must be most concerned, since in such social consideration lies the hope of the diminution and perhaps the elimination of the tragedy of this disease.

The new motive power in the social service nurse is civic intelligence, closely akin to the mission spirit, but with a different symbolism and direction. Under this influence the nurse is becoming socialized, made a part of the community plan for communal health. The nurses grow eloquent on the futility of halfway measures. A body of intelligent seekers for economic light has been developed. They stand ready to serve and to co-operate with the social forces for this end. This develops a sense of the importance and significance of the calling, gives an impetus to acquiring skill, to observe and report social symptoms, directly linked as they are with the physical destiny of the individual patient.

The writer would urge further increase of visiting nursing in the tuberculosis campaign; the employment of nurses in the homes; that measures for treatment, relief and control be comprehensive in the hands of a sympathetic individual and the work intensive; that it be standardized, and standardized by nurses competent to apprehend the implications of their work.

The care of the premises as well as of the patient should be under the supervision of nurses who might be held responsible for the disinfection and who should supervise the labor of the unskilled, untrained, and sometimes unreliable municipal employees.

Secure, if you can, the woman having personality, which in this instance is synonymous with an aptitude for the service and moral zeal for the cause. The "best nurse" is none too good. Make the appeal lofty enough to attract to this service those well trained of character and intelligence. Standardize the organization as well as the work of the nurse and do not be timid about high standards. The importance of the work is diminished, and the "call" is belittled when the requirements are minimized and when the "cured case" is considered good enough for the service.

The nurses' organizations and some individuals in the profession have been inspired to inaugurate some of the work for the tuberculous. Valor exists among many and can be developed among more, for the appeal of nursing is strong in many natures and the woman's instinct to care for the individual is capable of development for service to the community.

The record of the nurses in the control of tuberculosis can thus far be rated as good. It can be better when those engaged in the same field cooperate with them in keeping high the standards of efficiency that leaders among the nurses cherish.

THE NEW JERSEY TUBERCULOSIS EXHIBIT

By Millard Knowlton, M.D.
Trenton, N. J.

In building an exhibit, as in building a house, the architect's work must be done first. Preliminary plans for the picture part of it will include the color scheme, size and kind of frame, character of mounting, size and surface of picture where photograph is used, style of lettering, method of hanging, relative number of photographs, maps, charts, drawings, and signs, method of packing for transportation, etc.

The first impression of the visitor, which is always a lasting one, is gained by his first glance around upon entering the exhibition hall, hence the importance of having a pleasing color scheme meet his eye. To be of value for exhibition purposes the color scheme should be such as to make the pictures and lettering striking as well as the whole effect pleasing. As for the lettering, it may be laid down as a general rule that a dark letter on a light card will be more striking, and legible at a greater distance, than a light letter on a dark card. After running over the scale of colors and considering the whites, the blacks, the grays, and the browns, we decided upon a light-brown card with a black-and-white toned picture and with black lettering. Brown letters with a sepia picture would have been more artistic but certainly less striking. The shade of brown selected for the card is so neutral that one is scarcely conscious of its presence. What is seen most clearly is the picture and the lettering.

Most exhibitors around New York have mounted their pictures on compoboard. We have preferred cardboard on account of its lightness. In order to get the color card we desired, we found it necessary to secure paper of the proper shade and either paste it on cardboard or have cardboard made using this paper as a surface. The pasting process gives a soft, velvety surface, such as easily catches dirt. By furnishing the paper and having the cardboard made, we secured a surface without gloss, yet so smooth as not to catch dirt or show fingermarks. The smooth surface will more than double the life of an exhibit so far as getting dirty is concerned.

On account of its convenience for transportation, we have adopted 22 x 28 inches as a standard size for the card. The photographs are enlarged to 14 x 17 inches, and only one picture is mounted on a card. I believe it to be a mistake to use more than one picture to a card for exhibition purposes except under special conditions.

The lettering is made with either water color or a Japan base for the pigment, avoiding all oil or varnish so that there is no gloss or glint, no matter from what angle it may be viewed. In fact, the letters, card, picture, and frame are all made with such a surface as will not reflect light and will not blur or hurt the eyes when seen from any angle. It requires some insistence in dealing with the frame-maker and the letterer to get these results, but the results more than repay the effort required to obtain them.

As for the style of letters, we have preferred a plain letter sometimes called by the sign-painter a block letter or by the printer a Gothic letter. Sign-painters also call it "one-stroke" work, because it requires a minimum amount of effort. This lettering appears to be the most legible of any we could find and was obtained only after repeated efforts and the submission of several samples of work by the sign-painter.

For the large signs to go above the sections we have violated the rule laid down above, however, by using a gilt letter on a dark-brown background. Gold is perhaps the best color to use in this way, as it has its own peculiar glitter. A few of the pictures have been hand-colored to add to their attractiveness, but for the most part they are being shown in their original tones. For the general background a dark-green burlap is satisfactory.

We use frames that are only three-eighths of an inch thick. While light they are firmly constructed, and possess strength enough to stand up under ordinary strains. They are made of cherry wood, but are stained brown with a dull or flat finish.

The device for hanging consists in auger-borings in the back of the frame that will admit special wire eyelets. Any picture may be suspended either from screw-heads on a spanner or from eyelets attached to the picture above. These eyelets are removable so that the frames may be taken down very quickly and packed for shipment. As nothing appears on the frame but the auger-borings, frames may be stacked one upon the other and in that way packed into a trunk.

In constructing the exhibit, however, we have followed the precedent of using grooved boxes for transportation and have used the same boxes to fasten uprights to for hanging. We are thus entirely independent of walls and do not have to drive nails or screws into either walls or floors. This effectually removes one of the chief small objections on the part of

owners to having the exhibit put up in their buildings. We found by experience, however, that the boxes are not stable enough to afford the best protection for the light frames and are therefore having fiber-trunks made in which to transport the pictures. The frames are packed in flat and strapped down so that they are held firmly in place. By having the entire exhibit in trunks, we can carry it as excess baggage which gives us rapid transportation at practically a freight rate instead of an express rate.

Fifty frames may be carried in a trunk. Four trunks therefore will carry an entire exhibit of two hundred frames. The cost of these four trunks is much less than the cost of twenty standard boxes required to carry the same number of frames. The frames are better protected in the trunks and the trunks themselves will last much longer than the boxes. Besides the other advantages, the substitution of fiber trunks for grooved boxes reduces the shipping weight very materially. Where objects like sputum-cups, etc., are fastened to frames for display, it is obvious that such frames cannot be packed flat. For these, therefore, a grooved trunk must be provided.

Elimination of the boxes necessitates another device for hanging the pictures independently of walls. Instead of attaching the uprights to boxes by means of pin-hinges, we find that they can be prevented from tilting forward or backward by the simple expedient of providing them with legs. A two-foot base is sufficient for an upright ten feet high. To obviate the necessity of longitudinal braces, we are considering the use of special castings, similar to the castings used in fastening the rails of an iron bed to the end, to fasten the spanners or top rails to the uprights. This should make a rigid support for the pictures and the burlap used as a background.

While planning the technical details outlined above, we were also busy with plans for the subject-matter to be used. These plans include a comprehensive treatment of the tuberculosis problem together with a relatively accurate emphasis upon its various phases. This may be shown by the following arrangement of sections:

Section I. "The Nature and Extent of Tuberculosis" (12 frames).
" II. "The Great Cost of the Disease" (12 frames).
" III. "How Tuberculosis Spreads" (15 frames).
" IV. "Where Tuberculosis Thrives" (12 frames).
" V. "How Tuberculosis is Cured" (15 frames).
" VI. "How to Prevent Tuberculosis" (18 frames).
" VII. "What You Should Do to Prevent It" (18 frames).
" VIII. "What You Should Do to Prevent It" (18 frames).
" IX. "Your Community's Work in Prevention" (18 frames).
" X. "The Law and Tuberculosis" (18 frames).

It will be noted from the above that the greater emphasis has been placed on the side of prevention. Much stress is laid upon the duties of individuals in this important work. The last section reflects the crystallization of public opinion into legal measures for the purpose of prevention.

Finding pictures to illustrate the subject according to these plans was a difficult task. We were obliged to take most of them in order to obtain suitable ones. While this work required considerable time, it proved doubly advantageous in that it secured pictures that are both new and illustrative of conditions in our own State.

The selection of pictures should be made with great care. The most valuable ones are those that tell their own story with the least explanation. Pictures that require the constant presence of a demonstrator to explain their meaning have no place in a tuberculosis exhibit. Human interest should always be the basis of selection. A dirty yard with no children playing in it, or a dark room that is unoccupied, has little intrinsic value for our purpose. This principle has been our guide in the selection of pictures for our exhibit. The captions for such pictures can usually be made short and concise, so that an exhibit can be read in the same manner as a busy man reads a newspaper—by a glance at the headlines.

In addition to the material described above, we carry a few models, flashers, and pathological specimens, such as may be found in almost any tuberculosis exhibition. A set of maps of New Jersey is being prepared to show the tuberculosis deaths and death-rates by counties, hospital beds by counties, cities having visiting nurses, cities having dispensaries, etc.

Another rather unique feature is in course of preparation. It is a large bottle having the label, "Doctor Fako's Consumption Cure, Guaranteed." Inside the bottle is an electric light operated by a flasher. When the light is on, a skull and cross-bones and the word "poison" appear. The bottle is mounted on a card bearing the statement, "Consumption Cures do not Cure, They do Harm."

Proper food for a consumptive is a subject that heretofore has received scant attention in a tuberculosis exhibit. The cure of the disease is said to consist in fresh air, rest, and food. Exhibitors have exploited fresh air and rest in every conceivable manner, but have dismissed the food side of the proposition with scarcely more than an injunction to eat good food, and a mention of milk and eggs as belonging to that category.

With the idea of pointing more definitely to what should be done in the way of feeding consumptives, we are having prepared, and will soon add to our exhibit, a set of paper-pulp models showing a specimen day's food

for a consumptive ready to serve. With this we shall use appropriate signs stating the raw material required for the day's rations and the cost of this material when bought in family quantities. We have figured the raw material for a day's diet, such as would furnish 3600 calories of energy, to cost about thirty-four cents. This cost may be considerably reduced by using coarser food supplying the same amount of energy. We also show by means of models some half-dozen foods of equivalent caloric value, using a quart of milk as the standard. We are preparing for distribution in connection with this food exhibit a leaflet giving a few simple and specific directions for buying and preparing food. In view of the great importance of food in the cure of tuberculosis, it is believed that much more attention should be given to it in educational work. Whether or not we are proceeding along the best lines can be determined only by further experience.

Probably the most popular feature of our exhibit is the motion-picture equipment. The motion-picture is without doubt the most important educational device that has been brought forth since the invention of the printing press. One need but to observe the eagerness with which people flock to the motion-picture theaters and the permanence of the impressions gained in such places, to realize the value of the motion-picture as an educational factor. We are using five films which seem to have the most value for hygienic and sanitary purposes of any now available. These are: "The Man Who Learned," "The Fly Pest," "Boil Your Water," "The Red Cross Seal," and "The Awakening of John Bond."

As an advertising feature motion-pictures are of first importance. The tuberculosis exhibition as such has ceased to be new and does not attract in many communities. The mere announcement, however, of "Free Motion-pictures" will insure a "packed house" for the tuberculosis show.

Only a few films that have merit for our purpose are available. Up to the present time American manufacturers have been willing to treat the tuberculosis problem and allied subjects from a dramatic point of view only. Some of the results contain so much story and so little kernel as to be of no value. Others are ludicrous, to say the least, owing to inadequate supervision of technical details. Even the best one of the two or three tuberculosis films that are really good shows a doctor using a clinical thermometer without sterilizing it and a nurse shaking the dust out of blankets in an infected home.

The dramatic side of disease-prevention problems has a value that we propagandists cannot afford to overlook. We must not lose sight of the fact, however, that definite results in disease-prevention depend upon a

general diffusion of accurate scientific knowledge. In its last analysis, therefore, our educational problem is to teach science.

Science as such never has been taught and never will be taught by means of the drama. The photoplay is no exception to this rule. Dramatic pictures, like "The Awakening of John Bond," "The Red Cross Seal," and "The Man Who Learned," are of great value, and their production by the commercial firms should be given all possible encouragement. But if we are to utilize the motion-picture to the fullest extent in our work, we need also pictures of a different character. We need pictures produced primarily to give instruction rather than to entertain. We need to illustrate our lectures with motion-pictures instead of still slides. There should be some central agency for the production of these pictures for the entire country. Such a work may well be undertaken by the National Bureau of Health which we hope to have established in the near future.

In the tuberculosis field alone such things as sanatorium life, a fresh-air school, a child putting on his wraps ready for school, the making of a Klondike bed, a patient destroying his sputum, proper disinfection and renovation of a room after the removal of a patient, etc., can be shown in motion-pictures better than by any other exhibition device.

The equipment necessary to make such pictures is not so expensive as to be prohibitive. The motion-picture camera for ordinary outdoor pictures need not cost much more than a first-class camera for regular photographic work. The film costs about three and a half cents per foot. Both negative and positive will cost about seven cents per foot. Supposing that to start with only half the negatives taken were worth reproducing, the first positive would still cost less than the regular film purchased from one of the companies licensed by the Motion Picture Patents Company. Their standard price is thirteen cents per foot when selling films for educational purposes. After the negative is once made, the cost of material for a new positive is only three and a half cents to four cents per foot. In a studio equipped for it the work of printing would bring the cost up very little above this figure.

In using motion-pictures in our regular campaign, we feature them in our advertising, and then, when the meeting occurs, we have a lecture given before the motion-pictures are shown or have short lectures between reels. The people come to see the pictures and we take advantage of the opportunity to talk tuberculosis prevention.

Several practical questions are involved in starting a motion-picture campaign. Among the first is the kind of machine to buy. Unfortunately, none of the manufacturers put out an equipment specially suited to road

work. It requires some care and knowledge of the machines, therefore, to make a wise selection. Some of the points to be considered are the following:

1. *Safety from fire.* Not all American machines have the film so enclosed as to minimize danger of fire at the aperture. Most fires, however, are said to be caused by a defective take-up which permits the film to run down to the floor and come in contact with the hot rheostat. The best take-up is said to be one operated by a chain and having an adjustable tension which can be easily controlled. An induction coil that does not get hot may be used instead of a rheostat if a suitable one can be found.

2. *Quality of picture.* The picture should be absolutely flickerless. If the film is accurately perforated, a good operator can secure this result with any one of a number of machines.

3. *The mechanism.* Some manufacturers buy the gears and merely "assemble" them in their own shop. Others build their machines from the ground up and thoroughly test them before they leave the factory. Some machines are said to last two or three times as long as others. Much depends upon the kind of gears used, the character of material, and the simplicity of construction. Some machines require additional rollers in the magazine valves to avoid scratching the film.

4. *The lamp and lamp-house.* Most American machines have too small lamps and lamp-houses to stand the high amperage required for daylight work. Manufacturers realize this and are beginning to provide a more substantial equipment for light. The electric arc is, of course, the only light practicable for general motion-picture work.

5. *The rheostat.* A rheostat, to be satisfactory, should be adjustable so as to furnish about fifteen amperes of current for the still slides and three or four times that amount for motion-pictures. Even a higher amperage may be needed for daylight work. We could find no satisfactory rheostat on the market and so had one made to meet our requirements. An induction coil can be used as a substitute for a rheostat on alternating but not on direct current. Coils now on the market under various trade names are so heavy as to be inconvenient for road work.

6. *The stand.* The stand or table for supporting the machine should be light enough for transportation and yet sufficiently strong to be firm and rigid. The heavy, cast-iron pedestals often used where a machine is permanently installed are impracticable for a traveling show.

7. *Motive power.* So little power is required to operate some machines that the operator is not averse to running them by hand. A motor-driven

machine will give a little steadier and better picture. Some of the best and most serviceable machines are so difficult to operate that a motor is almost a necessity. Only a few machines, however, are considered safe enough to be passed for a motor where inspection is rigid.

8. *The booth.* The celluloid of which motion-picture films are composed is highly inflammable. There is therefore some danger of fire through careless handling of a badly constructed machine. In its hysteria to provide a remedy the public has decreed that all machines, regardless of their construction, shall be enclosed in a supposedly fireproof booth. The booth required in some States weighs more than half a ton, and is quite a burden to a traveling show. The production of a satisfactory non-inflammable film will enable us to dispense with such a cumbersome bit of baggage.

9. *Inspection.* A few States have rigid laws governing the use of motion-picture machines. In many places, however, their regulation is left largely to the various municipalities. It goes without saying that a motion-picture equipment should conform to the law in every particular. It should also conform to the rules of the board of fire underwriters in order that the insurance on buildings where it is used may not be jeopardized.

10. *Transportation.* The motion-picture equipment is best shipped in trunks. Fiber trunks are probably the best, though some canvas trunks hold up very well. Boxes are not worth considering. The mechanism of some machines should be carried and not shipped, as rough handling is liable to result in injury.

In using motion-pictures it must be remembered that, no matter how good the equipment, if good results are to be secured on the screen it is necessary to have a skilled operator. In conducting a continuous campaign we have deemed it advisable to employ an operator on a regular salary, rather than depend upon securing a satisfactory one when needed.

We have been in the habit of sending a man ahead of the exhibit with a camera to take pictures of local conditions. In this way we have found rooms without outside openings and hence without a direct supply of light and air, in towns of from 6000 to 10,000 population. We have taken pictures of dirty back yards, interiors where many people sleep, dirty playgrounds, etc., for use in the local campaign. In the general exhibit we have been especially careful to use only such pictures as have human interest. This is not necessary when showing pictures of local conditions. In the general exhibit we have been particular about having only one picture to a card. In showing local conditions we use a smaller print and mount from two to

four on a regular 22 x 28 inch card. The fact that they are local is sufficient to attract attention to them.

This portrayal of local conditions with the camera has been most effective in obtaining immediate results. In one place, for example, before the exhibit had been going two days, there was a strike in one of the factories of the town, which we settled by agreeing to take a picture down from our exhibit upon condition that the garbage pile shown in the picture be cleaned up. This was done immediately. Since then a garden is flourishing where there was once nothing but garbage, rubbish, and ashes. In another instance a board of health ordered inspections of lodging-houses and tenement-houses to be made after we had shown up one of the worst cheap lodging-houses I have ever seen. It consisted of a basement room without light and air, where as many as seventy-five or eighty men have sometimes been housed at once. The success of this method has been so marked that I believe the taking of motion-pictures of local conditions would be well worth considering.

No matter how much care may be exercised in the preparation of an exhibit, its chief value depends upon its use. It should be regarded as a mere tool with which to work. A good tool, if badly used, will give indifferent results.

We have found that the effectiveness of the exhibit is greatly increased by doing some advance organization work. It is our desire that the people in each community feel that the exhibit is theirs to use to the best advantage. Two or three weeks before the time set for the exhibit in a city a representative visits the city and meets the local committee for the purpose of outlining the work that they will be expected to do in arousing interest and securing the widest publicity. After this most important conference we are usually obliged to leave the matter largely in the hands of the local committee until three or four days before the exhibit opens, when the exhibition force can take personal charge and see that all the details are properly carried out. In the mean time a regular program of lectures and addresses, mostly by local people, has been arranged. No effort is spared to make the local interest deep and far-reaching.

In advertising the exhibit we use first a half-sheet poster announcing "Free Motion Pictures at the Tuberculosis Exhibit," together with the place and date. The poster also contains a large double red cross. We also put out in as large quantities as can be used a sixteenth-sheet dodger giving more detailed information in regard to events. During the exhibit

we have a stenographer take down the speeches for the press unless the speaker can furnish us a manuscript copy.

Literature is distributed freely through all available channels. Our folder, "How to Prevent Tuberculosis," and a "Talking Tuberculosis" dodger, à la Routzahn, are printed in hundred thousand lots. We are preparing a pamphlet of "Instructions to Patients" and a special food circular for limited distribution. We contemplate the preparation of a children's circular for distribution through the schools.

In most places our campaign is city-wide. In Newark, however, we have followed a different plan, and have just closed a five-weeks' school campaign. During that time we have had the exhibit in five different public-school centers, and have thus covered the entire city by districts. The co-operation of the school authorities in both the public and the parochial schools has enabled us to place our literature in the hands of each of the 70,000 school children in the city, thus reaching those who have not had the opportunity of seeing the exhibit. Our experience has confirmed the opinion that we have reached a time in the tuberculosis educational work when it is wise to break up a large city into neighborhood groups in order to make our work most effective.

As a climax to the comprehensive program we have carried out in the schools, the exhibit is now being placed in a vacant store in the busy part of the city, and motion-pictures are to be shown in the playgrounds and parks. A couple of weeks spent in this kind of campaigning will complete what we believe to be one of the most thorough and systematic tuberculosis campaigns ever attempted in any city.

HYGIENIC AND ECONOMIC FEATURES OF THE EAST RIVER HOMES FOUNDATION

By Henry L. Shively, M.D.
New York

The need of improved city dwellings especially adapted to the requirements of tuberculous families and delicate persons liable to tuberculosis has been a logical outgrowth of the demonstration in recent years of the good results obtained in sanatoria, the day camp for adults, and preventoria and open-air schools for children. In its broadest aspects tuberculosis is a social disease against which, as is the case with many other wide-spread infections, the physician, who for the most part comes in contact only with the individual patient, is alone incapable of adequately contending. The statesman and lawmaker, the sanitary engineer, the scientist and research worker in his laboratory, the planner of towns, the architect who designs our homes and public buildings, the educator, the moralist and religious teacher, the wealthy philanthropist, charitable societies and churches, municipal authorities and health boards, the magazine and newspaper writer, the intelligent patient himself, every good citizen—all must co-operate with the practising physician in the increasingly effective campaign against tuberculosis.

In most civilized countries such scourges as cholera, smallpox, yellow fever, and the Asiatic plague, which formerly decimated entire populations, are now held well in check through the intelligent application of modern principles of sanitation. Only recently has it been realized that typhoid fever is a preventable disease which is a reproach to the community in which it exists, and it is still not generally recognized that numerous other diseases, among them tuberculosis, the most formidable of all, are also amenable to control and ultimate suppression if existing knowledge could be sufficiently applied. It is only a question of cost and general enlightenment of the public. It is such considerations as these, with the popular interest in the crusade against tuberculosis, which have led to the erection in the past decade of the numerous sanatoria in this country and Europe. The results

obtained in them show that consumption is curable in its earliest stages in all climates if an abundance of fresh air and sunlight, baths, suitable nourishment, rest, and watchful medical supervision can be obtained. These desiderata, it will be observed, are after all only the elementary conditions of healthful living, good for sick and well alike, and it ought not to be necessary, in order to obtain them, to send people away from their own homes. Unhappily for the enormous number of the tuberculous poor in large cities, the benefits of sanatorium treatment are often unavailable on account of the great cost of treatment, the insufficient capacity of existing institutions, and the too brief period of time the patient is permitted to remain in them. For the well-to-do consumptive a term of sanatorium treatment is ideal: he learns by precept and example how to get well and how to keep well, and upon his return to a well-appointed home he can continue to practise the hygienic principles which he has been taught and through which alone the stability of his recovery is rendered probable. For the relatively small number of poor patients, however, for whom sanatorium treatment is possible, the lesson learned at great cost is of no permanent benefit if upon their discharge from the sanatorium they are returned to the unfavorable living conditions which generated their disease. There is manifestly also a great economic loss in sanatorium treatment in the rent of the home which continues while the patient, at added expense, is receiving institutional care with its necessary interruption of family life. Prolonged absence of the homemaker and a break in domestic ties are unfortunately also often a cause of unhappiness which may invite the disasters incident to the frailty of human nature, even in its most sacred relations. It would seem to be not impracticable to bring many of the best features of sanatorium care to the patient in his own home, where at low rentals he may enjoy them as long as is necessary or he may desire.

It has for a number of years been the cherished plan of the writer to assist in the solution of this problem by the erection of a type of building which would obviate the necessity of sending many patients away, and which would provide discharged sanatorium patients with suitable hygienic conditions on their return. Sanatoria, like hospitals, are not only costly to construct, but there is the endless expense of maintenance. The sanatorium dwelling, on the other hand, can be made to carry itself and pay a fair return upon the investment. The practical accomplishment of this design on a large scale and with ample means to provide for the success of the experiment was made possible through the munificent and large-hearted philanthropy of Mrs. William K. Vanderbilt, Sr., in her endowment three years

ago of the East River Homes Foundation. It is believed that this design, which is unique in character, will be wide reaching in its effects in demonstrating the possibilities of the home treatment of suitable cases of tuberculosis, in making more permanent the good results of sanatorium treatment, and in providing the protection of a hygienic home for those who are delicate and anemic, or convalescent from other exhausting diseases, and thus especially susceptible to tuberculosis.

The first experiment at all comparable in purpose to the plan adopted by Mrs. Vanderbilt was carried out in a modest way by the Swedish National Anti-tuberculosis Association in 1904 in Stockholm, where, in a wooden building not especially designed for the purpose, an attempt was made to keep under medical and hygienic supervision twelve workingmen's families containing one or more adult members with consumption and living with their children who had not yet contracted the disease. The special object of the society was to prevent the development of tuberculosis in these children. After three years it was reported that they continued robust, appeared in every way healthy, and none of them showed signs of tuberculosis—a finding in marked contrast to the well-known prevalence of tuberculosis among children in most tuberculous families.

In any improved multiple dwelling project in New York the first and most serious obstacle encountered is the vicious limitation of the ordinary twenty- or twenty-five-foot city lot, which is responsible for so many of the tenement ills from which our population suffers. It is physically and economically impossible to provide adequate light and air and sufficient courts, or to properly utilize the roof spaces on a city plot less than a hundred feet square. For the purpose of Mrs. Vanderbilt's foundation there was fortunately found an eligible site comprising eighteen city lots, or considerably more than four times this minimum area. This site in East 77th and 78th Streets, adjoining the John Jay Park and commanding a fine view of the islands and waterfront of the East River, with its ever-changing panorama of steamers and sailing craft, is in all respects ideal for the purpose, having unobstructed air and light from all directions, permitting street façades with balconies on three sides, and on the fourth to the west adjoining the open playground of a public school. Other advantages of the site are in the character of the neighborhood where advanced social reforms in other directions are being worked out. To the north and south are blocks of model tenements, nearby are the Junior League Club House for working girls, the East Side Settlement House, a Carnegie Library, a public school, and a municipal bath-house.

As completed and now nearly two-thirds occupied, the East River Homes are four large fireproof buildings which will house three hundred and eighty-three families in suites of from two to five rooms. There are seventy-five suites of two rooms, two hundred and twelve of three rooms, sixty of four rooms, and thirty-six of five rooms. There are ample courts for air and light to which access is had through passageways extending from street to street, designed after the Durchhäuser of German and Austrian cities. These open passages insure a free circulation of air in all the courts. Outside staircases in each of the four corners of the large interior courts afford separate entrance to each suite of rooms, thus securing greater privacy and quiet for the tenant and eliminating entirely the dark, ill-ventilated, disease-breeding interior hall and staircase, which are such abominations in the ordinary city tenement. These open stairs are provided with safety treads set in concrete; the steps are graduated in an easy pitch comfortable to ascend, and are protected from rain and snow by louvers of wire glass projecting from each story. The recesses in the angles of the courts in which the stairways are built are lined with white glazed tile and the vaulted arches are of Gustavino construction. At each turn of the stair a seat is let in the iron railing to provide a resting-place for children and invalids. It is very noticeable, however, that these stairs in the pure fresh air are far less fatiguing to ascend than the ordinary, stuffy, interior staircase. The idea is new only in its application to housing for tuberculous families, for the open stair is a feature of domestic architecture long familiar in cities of southern Europe. The Minelli-Contarini Palace in Venice, built in the fifteenth century, has a beautiful outside staircase, and also the well-known Château de Blois in France has an ornate open stair which constitutes one of its conspicuous architectural beauties. Thirty years ago Mr. Alfred T. White used the open stair in a modified form in the model tenements built by him in Brooklyn. The construction is indeed an old one, has been well tried out, and is thoroughly practical. It is believed that in the almost subtropical climate of New York City, for seven or eight months of the year, the open stair is peculiarly suitable. As utilized in the East River Homes, a larger number of staircases than is usual have been necessary, and it is probably too costly a design to permit of its general adoption in commercially planned flats and tenements to produce a high rate of income. For the purpose of this foundation, however, to preserve the privacy of each suite of rooms as a unit, to avoid the evils of common hallways, and to obtain the maximum of air and light, the additional cost entailed is outweighed by the numerous advantages secured.

The entire roof area of these sanitary homes is utilized for outdoor life and fresh-air treatment. The roofs are fitted with loggias, open and partially enclosed toilet rooms, comfortable seats and steamer chairs, and upon an upper deck are spaces for open-air drying of linen. Flowering plants and shrubbery, games, swings, and an open-air school for the children make the roofs as attractive as possible and encourage their fullest use by the tenants. There has also been established in the buildings a diet-kitchen, from which families are supplied with milk and eggs of good quality, well-cooked cereals, and nutritious broths at low cost.

On the façades fronting the park and streets are individual balconies on every floor, communicating with the bedrooms and living-rooms by large triple-hung windows extending from ceiling to floor, thus making the balconies continuous with the floor areas and affording opportunity for outdoor sleeping and dining. By having three window-sashes instead of the two, which are usual, it is possible to have open two-thirds instead of half of the entire window space.

The saving in floor area by the abolition of common interior halls has rendered it practicable to make available a larger percentage of space for bedrooms than is usual in the ordinary tenement-house. Bedrooms and living-rooms are as far as possible situated in the front of the buildings with windows directly on the street. Kitchens and bathrooms are in the rear and are provided with ample light and air by windows on the stairs, large interior courts, and yard between the buildings. The rooms are purposely of moderate size to encourage simplicity in living and easy housekeeping.

Each suite of rooms has its own bathroom and hot-water supply. The porcelain bathtubs are built into the wall, and the tiled floors are brought up to the bottom of the tubs in such a way that dirt and dust cannot collect. In each bathroom there is also a free standing washbasin. The kitchens each contain a gas range, sink, and stationary laundry tubs. Direct drainage for refrigerators and wall receptacles for garbage and waste, with outside ventilation, are provided. Over the gas ranges are hoods communicating with an exhaust flue for carrying off odors and vapors of cooking. These flues are equipped with electric fans which produce a continuous aspiration of air from the apartments and thus also serve a most useful purpose of ventilation. The flooring is of monolithic material and coved up on the walls for six inches in such a manner as to avoid angles. The surface is warm and resilient, but of such a character as not to admit the tacking down of carpets. Floor coverings must be rugs which may be readily taken up for frequent cleansing. The interior finish is simple but

attractive, and the walls are painted in soft pleasing tints with a hard enamel paint which can be easily washed and wiped down. It is believed throughout that whatever is good, clean, and sanitary in a hospital is equally good in the home.

In the basement is an individual store-room for each family, and there are lockers for baby carriages at the end of an easy incline leading to the street. In each of the basements of the four buildings three spacious laundry rooms with steam dryers are provided. The suites of rooms are heated by hot water from a central system of high-pressure boilers, and care will be taken to insure control and regulation to avoid overheating and insufficient humidity of the air which is warmed. The rooms are lighted by electricity, it having been ascertained that electric light can be supplied from a plant in the buildings at a price to compare favorably with the cost of gas. This is rendered possible by the utilization of the exhaust steam in running the dynamos. In buildings especially constructed for a sanitary object the vitiation of the air by combustion-products and the heating effects of illuminating gas are undesirable. Electric lighting is included for the tenant in the rental.

The East River Homes are not designed to be a mere charity nor to produce income in the ordinary commercial sense, but they are a humane and philanthropic investment, which, with lower rentals than are asked for equal accommodations elsewhere, is expected to yield a sufficient return to encourage the construction of other similar buildings in communities where they are needed. The income of this particular group of houses, however, will be devoted entirely to philanthropic objects according to the terms of the generous deed of gift creating the trust, one-half to be expended forever by the trustees in the warfare against tuberculosis, or until the dawn of that happy day for humanity when tuberculosis will be so far suppressed that further measures directed against it will be unnecessary.

A HOME HOSPITAL FOR TUBERCULOSIS

A New Experiment in the Treatment of Combined Poverty and Tuberculosis

By John A. Kingsbury
New York

About a year ago Mr. Percy R. Pyne, one of the managers of the Association for Improving the Condition of the Poor, called at my office to see me about a destitute Italian family in which he was much interested. Both the parents and two of the seven children, aged ten and two respectively, were ill with tuberculosis. Two other children, aged five and four, had sore eyes and running ears. The twin babies, two months old, were said to have bronchitis, while Frank, the remaining child, aged nine, was markedly anemic. The nursing twins of this tuberculous mother soon developed "pneumonia" and died. Naturally, our visitor had found the home in a state of great disorder and neglect. Investigation, however, showed that the family had been self-supporting and self-respecting until they found themselves in the grip of the white plague. The man, a carpenter, had a reputation for honesty; he enjoyed the confidence of his landlord, and had received credit at a grocery store in his neighborhood.

Learning, on the one hand, of the difficulty of finding institutional facilities for cases of this kind, and, on the other hand, of the greater difficulty of persuading the family to agree to break up, even temporarily, if vacant beds in suitable hospitals and sanatoria could be found, Mr. Pyne suggested that he would be glad to pay for the family's care in the country if a desirable place could be obtained. But a desirable place, of course, meant a place with hospital facilities. Consequently this, too, was an impracticable plan.

You are all experts here and doubtless you have had similar problems put up to you many times, but how would you solve the problem which I have just presented—no vacant hospital beds available, on the one hand; on the other, family ties so strong as to defy your utmost attempt to sever them even for a few months? Proper country care quite out of the ques-

tion. All of us are familiar with this deplorable condition, but with the splendid work of the tuberculosis associations,—local, State, and national,—fortunately the situation is becoming more encouraging each year, as the reports of the Executive Secretary of the National Association for the Study and Prevention of Tuberculosis have shown. Nevertheless, even at the present rate of progress we know that it will be many years before we have all the beds we need. Last June, at the National Conference of Charities and Correction, Mr. Homer Folks, in his presidential address, made an interesting comparison of the actual number of beds becoming available for tuberculosis in hospitals, sanatoria, and day camps in the United States with the total number of beds needed (300,000). Mr. Folks showed that the annual increment is less than 1 per cent. of the total need. "The total population," he continued, "is increasing rather more than 2 per cent. per annum. Comparing growth of hospital provision with growth of population, we are apparently still losing ground, the need increasing twice as fast as the supply." Moreover, we know that there will always be a goodly number of well-meaning persons who, no matter how sick, will not be persuaded that they are sick enough to leave their homes for a hospital.

How, then, shall we provide adequate care for these, and for the thousands who have knocked at the hospital doors and are now in the waiting lines dying? That is the big problem in the prevention of tuberculosis. You would remind me of the tuberculosis dispensary, the clinic, the visiting nurse, the milk and eggs, and the other activities in connection with home relief and home treatment. Indeed, home treatment of some character seems to be the only alternative. Regarding the particular plan of home treatment which I am about to present, Dr. William Osler recently wrote: "After all, the battle against tuberculosis has to be fought out in the home." Yet those of us who have been in this fight for the past five or ten years realize how inadequate the ordinary method of home treatment is. The physician at the clinic does not see the patient often enough, and he seldom, if ever, sees the inside of the patient's home; the visiting nurse has so many cases that she cannot visit any one as frequently as conditions require. With such infrequent visits she cannot impress the patient with the importance of the doctor's instructions. It is not possible under the circumstances for her to see that the instructions are carefully followed. Usually the relief is inadequate. Consequently, the patient has neither fresh air nor sunshine; in cold weather he cannot keep his window open because the blankets and clothing are not ample; he cannot eat "all the good nourishing food he can eat" because he cannot get it; and under these circumstances

how futile it is to tell the patient that he must be free from worry if he would get well.

The International Congress on Tuberculosis, held here in Washington nearly four years ago, sent us all away with the feeling, if not the conviction, that at best home treatment of tuberculosis in the ordinary sense just described is woefully inadequate. Indeed, the apostles of home treatment had, some months prior to the Congress, received a shock when they read a report issued by the Committee on the Prevention of Tuberculosis of the New York Charity Organization Society, recounting that Committee's twenty months' experience with the home treatment of tuberculosis. The Committee reached the conclusion that in New York City the problem of home relief and home treatment is "impossible of solution . . . in an overwhelming and appalling majority of cases, if by relief is meant cure, and given only the means and methods now available."*

Please note carefully the language of the conclusion quoted, for I believe the excellent report of this valuable piece of work was grossly misunderstood throughout the country. I know that many good people in New York State got the impression that under no circumstances was successful home treatment feasible, and they were ready simply to throw up their hands. The erroneous notion gained from this report was not due to ambiguous language, but to a failure to read it fully and carefully. In some cases I know the misinterpretation was due to the fact that the report itself had not been read, but only a report of the report, or rumors based on a report of the report.

The following is also stated as a part of the Committee's second conclusion quoted above:

"Home relief and home treatment are inevitable in the solution of New York City's tuberculosis problem. . . . It is time that this be realized and acknowledged, that there are over 30,000 tuberculous persons in the New York City tenements, the most of whom will never see the inside of a hospital, though a smaller, yet still large, number will enter the hospitals only to die there, and that such treatment as the great army of sufferers is to receive is to be given in the New York City tenements.

"The selection of cases suitable for home relief should be made very carefully after combined medical and social investigation. When once such relief is determined upon, it is necessary for any permanent effect in these cases that it should not merely be adequate to relieve want, but that it should be abundant enough to make the patient gradually recover his

* "Home Treatment of Tuberculosis in New York City" (p. 40), January 8, 1906, to October 1, 1907. An account of twenty months' experience of the Committee on the Prevention of Tuberculosis of the New York Charity Organization Society.

lost strength and thus overcome his disease. And, furthermore, such relief must be continued over a long period of time. It is especially important that patients returning home from sanatoria with their disease apparently cured or arrested should be given every necessary aid to secure favorable environment or employment in order to guard against relapse."*

That part of the Committee's conclusion just stated appears to have escaped the casual reader, and hence the more or less erroneous impression that the experiment of the Charity Organization Society proved that successful home treatment in any sense is impossible. On the contrary, the conclusion just stated points the way to successful home treatment, although, perhaps, conditions then existing in New York City did not permit of that character of home treatment. The Vanderbilt Tenements—light, airy, and sanitary—were not then available.

Appreciating the almost insuperable difficulties encountered by the Charity Organization Society and others who have tried home treatment in the ordinary sense in which I have been using the term; and weighing carefully the accurately recorded experience of the Charity Organization Society, the New York Association for Improving the Condition of the Poor determined last spring to try a new experiment in the home treatment of tuberculosis, employing that term in a new and untried sense. Among the Association's two hundred and eighty-four families destitute because of tuberculosis we found that fifteen families were similar to the Italian family referred to at the outset, in which Mr. Pyne was interested.

A Home Hospital is the descriptive name we have chosen for our new experiment in the home treatment of combined poverty and tuberculosis, which was inaugurated March 19, 1912. On that day three of the twenty-odd families who are to be the beneficiaries of the experiment were moved into the beautiful East River Homes, 78th Street and John Jay Park, more familiarly known as the Vanderbilt Tenements. Our experiment differs widely from the experiment of the Charity Organization Society. The difference is clearly brought out by the answer to a significant question raised in the third conclusion of the Committee's report. I quote that part of the conclusion in which this question is raised:

" . . . The mere statement of what are regarded as essentials for such success as the sanatoria can show is sufficiently convincing for those who know the New York City tenement and its life. Air really fresh; food, good and abundant; freedom from work and worry; constant medical oversight; intelligence and ability to co-operate with the physician; and

* *Ibid.*, p. 40.

then suitable employment when the cure shall have been effected and an income therefrom sufficient to provide the air and food necessary if a relapse is not to be, after all, the final outcome of the long, hard struggle,—where are these to be found by the crowded and constantly more crowded New York City tenement dweller?"*

The answer indicating the difference between the two experiments is as follows: We believe that in the East River Homes we have found the place where the crowded New York City tenement dweller may get air really quite fresh; we are providing food, good and abundant; there is constant medical oversight in our Home Hospital; with two or three slight exceptions the families have shown intelligence, ability, and readiness to co-operate with the physician; it is not necessary for the patient to work, and, indeed, he is permitted to do so only by direction of the physician. Under these circumstances I think you will agree that the patients ought to be free from worry. It remains to be seen, however, whether we shall be able to find suitable employment when the cure shall have been effected, and an income therefrom sufficient to provide the air and food necessary if a relapse is not to be, after all, the final outcome.

In order to insure the permanency of the cures which we effect, we plan not to dismiss any family from the Home Hospital until the patients have practically recovered full strength, until they are able to work full time. Neither shall we relinquish our supervision over a family until we have succeeded in putting them on a self-supporting basis. Moreover, when the families leave the Home Hospital we shall see that they are moved to suitable homes, where we shall continue our supervision until we are assured that the cure is indeed permanent and the family actually self-supporting.

In our experiment, then, we propose—first, to give adequate relief and wise treatment to a number of needy families in which there is tuberculosis; and, secondly, in so doing, to find out whether it is possible, in a sanitary tenement, under skilful medical direction and constant nursing oversight, with adequate relief and freedom from undue worry, ample fresh air and sunshine, and room for reasonable segregation—

1. To prevent the spread of tuberculosis from the sick to the well members of the family, and particularly to protect the children from infection.
2. To cure many of those in the early stages of the disease.
3. To afford reasonable improvement and to restore at least partial earning capacity to patients whose cases are only moderately advanced.

* *Ibid.*, p. 41.

THE DETAIL OF THE EXPERIMENT

Having been in operation only a little more than two months, our Home Hospital is, of course, yet too young to warrant the drawing of any conclusions as to results. I am sure, however, that you are all anxious to hear more about the details of the plan; the method of selecting the families and something of their character, and the manner in which they react to their new environment. You are probably anxious to know definitely what precautions we are taking to prevent the spread of infection, to what extent we are able to segregate the infectious cases, what the régime is with reference to the treatment of hopeful cases, what special provision we make for the care and education of the children, what staff is necessary to carry out the experiment; and last, but not least, you are probably anxious to hear a word in relation to the probable cost of the enterprise, so far as our limited experience will indicate it.

It is unnecessary for me to discuss in detail the housing of our families. Dr. Henry L. Shively, who, with Mrs. William K. Vanderbilt, Sr., Dr. Walter B. James, and others, is largely responsible for providing New York City with these beautiful East River Homes, so admirably adapted to the care and treatment of families having tuberculosis or a tendency to the disease, has already clearly described the hygienic and economic features of the East River Homes. Few hospitals or sanatoria are better adapted to their purpose than are the East River Homes. To appreciate this fully you should see them.

Through the generosity of a few of the leading philanthropists in New York City the New York Association for Improving the Condition of the Poor has been enabled to lease one entire section (twenty-four apartments) in one of these sanitary tenements, where we shall continue our experiment for a term of three years. The Trustees of the East River Homes have given the Association entire control of one stairway in one of the houses facing on John Jay Park and East River, and free access and partial control of the charming roof above it, and the very useful basement below, with its storerooms and its modern laundry equipment.

We shall have to use two, and possibly three, of our apartments for administrative purposes: office, clinic, supply rooms, and the common kitchen and dining-room, where the meals are prepared and served for the families in which the mother is too ill to do it herself. This will leave twenty-one or twenty-two apartments, which will accommodate probably not more than twenty families, as some are too large to be properly housed in a single

apartment. We have proceeded slowly and selected our families with great care. Consequently, we have to date admitted only seventeen families, consisting of thirty-one adults and fifty-two children, a total of eighty-three individuals. There are seventeen positive cases of tuberculosis, all adults; nineteen suspected cases under observation, fifteen being children and four adults. Of the positive cases eight are mothers and nine are fathers, all being wage-earners. One is a third-stage case, four are second-stage cases, ten are incipient cases, and two are said to be arrested.

The families participating in the experiment thus far have been for some time under the care of our Relief Department and dependent because of tuberculosis. The following indicates the type of families chosen for the experiment:

1. Families whose combined disease of poverty and tuberculosis was regarded as still in a hopeful stage, not strictly incipient, but still early cases of poverty and tuberculosis, were given preference.
2. Families thought to possess sufficient intelligence and willingness to co-operate in the scheme of rehabilitation.
3. Families whose dependency was due chiefly to the illness of a wage-earner was the third consideration.
4. Families in which the mother's illness made it impossible or inexpedient for her to keep the home and children in proper condition to secure immunity from the disease.

The following are three typical Home Hospital families,* with a brief description of their condition as we found them, in contrast with their present circumstances in the Home Hospital:

McGeary.—This family consists of Martin McGeary, suffering from tuberculosis, aged thirty-five years, a laborer, born in United States, Catholic; his wife, Mary Duffy, aged twenty-six, troubled with heart disease, a housewife, born in Ireland, Roman Catholic, in this country since 1890; and their two children, Mamie, nine years, born in this country, and Katharine, seven years, also born in this country. Both children are under observation suspected of having tuberculosis.

Before coming to the Home Hospital the McGeary family lived at 799 Second Avenue, where they occupied three rooms for which they paid $7.00 a month. The sun never shone into the dark bedroom, whose only ventilation was a breath of air from the three-foot shaft. The walls of the bedroom were constantly covered with moisture, as was the case with the other two rooms, although the sun shone into them for about one hour each day; The rest of the time they were dark and damp. There was no bath. The toilet facilities consisted of a common hall toilet in which the water often

* Names are used by permission.

failed to run. The kitchen was small and contained but one washtub. There was no hot water and no facilities for cleaning. The front room, the most desirable of the three, was occupied by the patient. The wife and two children slept in one bed in the dark bedroom. The home, though poor, was extremely neat.

This family, on the 28th of last March, was moved to the Home Hospital, where they occupy a four-room apartment with balcony, at a rental of $6.00 a week, with three bedrooms and a kitchen. The rooms are situated on the river front. All have sunny exposure for half a day. The windows are 8 feet x 3½ feet, and in one of the bedrooms there are two of these windows. The floors, instead of being full of cracks, as in the previous home, are of monolithic material. The walls, instead of being covered with paper, are painted with enamel so that they can be readily wiped down at any time. In the kitchen are two large tubs, a gas range with a hood to convey the smoke and odor from cooking well above the roof, and a sanitary garbage closet in the wall. Every room is provided with steam radiators. Each apartment has a good-sized bathroom in which the tub is set entirely in tiling in such a manner as to afford no chance for dust collections beneath. The most hygienic system of flushing the toilet is also provided. The patient sleeps in a room by himself, the wife sleeping in a separate room, while the children occupy a single room with two separate beds, having a room in which there are two windows. On retiring at night two-thirds of each of these windows are open in each room. During the day the family has access to the roof, which is provided with a pergola to protect them from the sun in the summer and the rain in the winter. Here are found reclining chairs, numbered to correspond with the different apartments of the hospital, to insure each patient his own chair. The surroundings are attractive, the entire roof having a pretty hedge of box and red geraniums. There is also a pleasant amount of distraction in watching the passing boats on the river about a block distant. For cold weather there is an ample supply of blankets and pillows; thus at all times patients may be comfortable. Reading matter is supplied. Nourishment is served at 10 A. M. and at 3 P. M. to all who are in need of it. There will shortly be on this roof an open-air school which all such delicate children as the McGearys will attend.

Shea.—This family consists of Patrick Shea, a moving man, forty-eight years of age, born in Ireland, in this country about twenty years; his wife, Catherine Casey, tuberculous, aged twenty-five years, a housewife, born in this country, Roman Catholics; and their four children, Ralph, seven years, Ellen, five years, Stella, two, and Howard four months. Of these children, the first two are under observation for tuberculosis. The infant, a very pronounced case of malnutrition, weighed merely seven pounds at three months.

This family lived at 416 West Fortieth Street, in a neighborhood most undesirable. They occupied three rooms, paying $12.00 a month. The rooms were all dark, especially the bedroom, which had ventilation only through the kitchen, which in turn received ventilation from a third room where the windows opened to the street. The bedroom was so dark it was not used for sleeping purposes, but simply for storage of wornout

furniture, of which they had a quantity. The man slept on a cot in the kitchen. The patient and all the children slept in one bed in the front room, where the sun shone for a short time each day. The walls were covered with cheap paper, torn and dirty. The floors were full of cracks, no bath, no toilet facilities except an ill-smelling, unsanitary, common hall toilet, in which the water often failed to run.

On March 27, 1912, this family moved to the Home Hospital, where they occupy four rooms with balcony at a rental of $8.00 a week, of which they are able to pay $3.00 per week. The sun shines in all the rooms a great part of the day. There are the same 8 x 3½ feet windows in these rooms as in all the other apartments; the same monolithic floors and heating apparatus, the sanitary garbage closet, stove, bathtub, and toilet arrangements. The patient occupies a single bed in a separate room and has been supplied with new bedding in sufficient quantity so that she is always able to sleep with two-thirds of her window open, according to the rule of the house. Two of the children have a second bedroom, while the father and eldest child have the third to themselves. The baby sleeps in the kitchen. Dishes and cooking utensils were provided so that there is no danger of contamination for the family at the table. Large dishpans have been provided for boiling the dishes. Wash-boilers were supplied, so that the clothing and bedding may be properly disinfected. The patient and the children spend the whole day on the roof, which has been described elsewhere, and are provided with meals in the community kitchen so that the mother need not exert herself unnecessarily. The children are cared for by the nurse and visiting housewives.

Piccrno.—This family consists of Rocco, aged fifty years, a laborer, born in Italy, a Roman Catholic, in this country twenty-five years, and his wife, Maria Manzo, suffering from tuberculosis, aged thirty years, a housewife, born in Italy and a Roman Catholic, with their four children, Rocco, ten years of age, Angelina, seven years, Salvatore, four years, and Ellen, three. Two of the children are under observation for tuberculosis.

They occupied two dark, rear tenement rooms at 57 Mott Street, for which they paid $11.00 a month. The dark bedroom was just large enough to hold a double bed, occupied by the parents, and a crib in which Rocco and Salvatore slept under decidedly uncomfortable conditions. The kitchen was barely large enough to hold a second crib, occupied by the two girls, and much too small for them. In the same room a lodger slept. The sun never shone in either of these rooms, and at best they were never more than half lighted. The house should have been condemned. The stairway was rickety and the hall toilets foul smelling. There was not only a complete lack of hot water, but a great dearth of cold water, as it often failed to run for hours at a time. The walls of both rooms were covered with dirty old paper, and plaster having fallen off in places. The floors were full of cracks, but as the woman was a good housekeeper, it was kept as clean as possible under the circumstances.

On April 13th this family moved to the Home Hospital, where they occupy four rooms facing the river, in which the sun shines most of the day.

They are able to pay $2.00 weekly on their rent and are also able to furnish a good part of their groceries. The patient was provided with a new single bed, warm bedding, and a separate bedroom. Two of the children have each separate beds in a room to themselves, while the father and two boys occupy a third bedroom with two large windows. The toilet facilities and kitchen arrangements of this apartment are duplicates of those already described. The family seems to particularly enjoy their bathtub; also, the electric light is still a great source of fascination to this family as well as others. The children and the mother spend the day on the roof. This family, as well as others, has been provided with tooth-brushes and combs and individual towels, all hitherto an unknown quantity.

Before being admitted to the Home Hospital the plan of rehabilitation was carefully worked out with each family. We endeavored to make perfectly clear to all the members of the family old enough to understand the nature of the experiment and just what each family's part in it would be. Consequently, there is a definite understanding with all able-bodied members of wage-earning age that substantially all the family income must be contributed regularly to the family's support. Generally, definite items of the family budget are borne by the wage-earning members, as, for example, part of the rent. I say part of the rent, for rent in excess of what the families were paying before moving to the East River Homes is borne by the Association. Continued participation in the experiment is conditioned upon the willingness of the family to accept the plan to do its part by way of contributing to the support of the family and carrying out the prescribed rules and directions. On the other hand, we have endeavored to make our part in the plan perfectly clear. Each family is made to realize that if it does its part faithfully there is no cause for worry, for there is no uncertainty as to where the next meal is to come from and there is no need of fear of eviction at the end of the month.

So far as necessary and humanly possible, a hospital and sanatorium régime has been instituted in each family. Everything affecting the lives not only of the patients, but of other members of the family, is carefully supervised, both on the social and on the medical side. Each family has a number of rooms sufficient to permit of segregation of patients and suspected cases. Only necessary articles of furnishings are permitted, and those are of a sanitary character, and if they were brought with the patient they were thoroughly sterilized before being placed in the apartments. All the unnecessary belongings were likewise sterilized and stored. Plenty of warm blankets and warm clothing has been supplied to all members of the families. Consequently, at all times the patients may sleep with the large triple-hung

windows extending from ceiling to floor, open two-thirds instead of one-half the entire window space. In width this window is almost equal to the end of the room itself. The patient may roll his bed through the window onto the communicating balconies, where, weather permitting, he may sleep absolutely in the open air. Likewise, the day can be spent on the roof without any cause for complaint from cold.

The advanced and moderately advanced cases are provided with comfortable quarters, where they are required to remain the greater part of the time under as complete segregation as the conditions and circumstances permit; *e. g.*, an infectious case is required not only to sleep alone, but to sleep in a room by himself, and to remain there at rest the greater part of the time. If an ambulant case, he must observe the utmost precautions when out of his room. We endeavor to impress upon the mind of every person in the family that no preventive measure is so important as the proper protection against the sources of infection. For the early-stage cases we are endeavoring to duplicate, as far as possible, the sanatorium régime. These patients, too, are required to sleep in a room by themselves with head to the window, open wide, or with cot slipped through the window onto the balcony when weather permits. They spend almost the entire day upon the roof, where there is a sweep of the best air that Manhattan affords. They are required to remain at complete rest, unless otherwise directed. Patients work only on the advice of the physician-in-charge, and when they begin work after being at rest they undertake light tasks, gradually increasing the amount of work as their strength permits.

The following indicates the nature of the important rules and regulations conspicuously posted in each apartment for the guidance of the families in the Home Hospital, and the Superintendent and her assistants, realizing that eternal vigilance is the price of success in this as in other enterprises, are morally certain that these rules are very generally obeyed:

1. No mother who is a patient or who is suspected of having tuberculosis is permitted to nurse her baby.
2. Patients and suspects are not allowed to kiss other members of the family, either on the mouth or elsewhere.
3. Patients are instructed when coughing or sneezing to hold a paper napkin before the face and then to place it directly in the waterproof bags with which they are provided.
4. These paper bags must be carefully wrapped by the patient in a larger and clean bag, and once a day they are collected in a still larger paper bag, the bag and contents being burned immediately in the furnace.
5. The ambulant patients are permitted to take their meals with the

other members of the family, but are required to use the utmost care with regard to utensils and articles which come in contact with the mouth. The family is required to use a butter-knife and a sugar-spoon. A large dishpan is provided in which, at the close of the meal, all dishes are boiled for fifteen minutes. The only napkins used are paper, which after each meal are placed in the bag and burned daily.

6. Patients are required to have individual hand towels, individual bath towels, individual soap, individual combs, and, of course, individual toothbrushes. No member of the family is permitted to use any article of wearing apparel or other utensil belonging to the patient and handled by him.

7. Soiled clothing, soiled bed linen, soiled handkerchiefs, etc., when taken from the body or from the bed, are placed at once in water and as soon as convenient they are taken to the laundry and boiled.

8. The patient is instructed never to perform any household duty, and particularly never to prepare or handle any food for the family without having first carefully and thoroughly washed and disinfected the hands.

9. Patients have been ordered to cleanse thoroughly and disinfect immediately after any accidental contamination with sputum. (Recently one of the men patients came to the office and asked the Superintendent for some "pure carbolic acid." Naturally, she wondered how he was going to use it. Whereupon he informed her that somebody had spit on the stairway, and he said, "I want to wipe the spot up thoroughly with carbolic acid.") We have, of course, forbidden expectoration anywhere except into proper receptacles which are provided, and these sputum cups are collected and burned once a day in the manner described above with reference to the paper napkins.

10. No sash curtains, draperies, or rugs are permitted in the apartments.

11. No dry sweeping or dry dusting is permitted anywhere in the apartments. The floors are regularly washed three times a week with a bichlorid solution, and the walls, especially in the patient's room, are wiped down with the bichlorid solution as frequently as the doctor requires. The flooring is of monolithic material, which material likewise covers up the walls for six inches from the floor in such a manner as to avoid angles. The walls are painted in soft, pleasing tints with a hard enamel paint which can be easily washed and wiped down.

12. Patients are regularly weighed each week.

13. Patients' temperatures are taken each morning and afternoon—mouth temperatures for the adults and rectal temperatures for the children.

14. The patient's pulse is taken once each day.

15. Every member of the family upon admission to the Hospital is thoroughly examined, weighed, and temperature and pulse taken and recorded. The well members of the family thereafter are weighed monthly and every one carefully examined every six weeks.

As with all matters pertaining to the standard of living, in the matter of diet we endeavor to bear in mind that the family income will probably

always be limited. While we see, therefore, that the family has plenty of good nourishing food, we also teach the family to economize. They are learning to select most economical foods. They are finding out how to cook the cheaper cuts of meat and other varieties of food in a manner at once most nourishing and palatable. The following sample schedule of the family diet is sufficient to indicate that the standard of living is not impossibly high, although the nourishment provided is ample. The principal difference between the food of the patient and the food of other members of the family, it will be noted, is the milk and eggs. Every patient, including the suspects, has at least one quart of milk and three eggs a day. Some patients take as high as two quarts of milk and five or six eggs daily. The following is a sample of the meals:

THE SCHEDULE OF THE FAMILY DIET

8 A. M.	Breakfast.....	Cereal—oatmeal, cornmeal, etc.
		Bread and butter.
		Eggs.
		Coffee for adults.
		Milk for children, and adults if desired.
10 A. M.	Milk and eggs or hot cocoa for patients and suspects.	
12 M.	Dinner.....	Soup—pea, bean, etc.
		Meat.
		Vegetable—potatoes or macaroni or rice, and peas or beans or tomatoes, etc.
		Bread and butter.
		A simple dessert.
		Tea or milk.
3 P. M.	Milk and eggs or hot cocoa for patients and suspects.	
5.30 P. M.	Supper.....	Rice and milk, or stew, or milk toast.
		Creamed potatoes or creamed codfish.
		Bread and butter.
		Milk.
9 P. M.	Milk and eggs for patients and suspects.	

Foods, it will be seen, are chosen by our dietitian, with special reference to the proper proportion of fat, proteids, and carbohydrates.

It is hardly necessary to repeat that it is yet too early to predict results with reference to prevention or cure. The gains in weight, however, for the single complete month of April are encouraging, if not significant. All but three of the seventeen patients who were in the Home Hospital during the month of April made some gain. The weight of one of these three remained stationary. Another of the three developed peritonitis and was sent to the hospital for a surgical operation. Although she lost eight pounds during the month, she regained four pounds in six days after returning to the Home Hospital. The other one, despite the loss of two

pounds, looks much better than when she was admitted. Nine gained from one to five pounds; five gained from six to ten pounds—one of these gained ten pounds and another eight and three-quarter pounds during the month. All of the fifteen children who were under observation as suspects made gains of from one to three pounds, with one exception, in which case the child held its own. With one or two slight exceptions all of the well children and adults either held their own or made some gain.

The patient who was away in the hospital for ten days on her return remarked that the patients had changed so much she scarcely knew them, and she spoke with evident emotion of what she called "the great fat wrinkles" on her baby's forehead. This baby was cared for by a neighbor in the Home Hospital during the mother's absence, and although a marasmus baby, gained eleven ounces in six days.

In some instances it was two or three weeks before the patients made any gain, but during the last week of April there were many marked gains. During the month ten of the patients were sent to the dental clinic for treatment; six were treated at the eye and ear clinic, and three were treated at the clinic for nose and throat trouble.

A most important feature of the experiment is yet to be undertaken. An open-air school for the delicate children predisposed to tuberculosis is to be conducted on the roof of the Vanderbilt Tenement. This is being arranged by the Board of Trustees of the East River Homes. The Board of Education has agreed to provide two teachers and to equip the school, which will open at once and will continue throughout the summer as well as the winter. There will be nothing unusual about this open-air school except that it will be right at home. For this reason probably they may be better fed and even more closely supervised than in the average open-air school. Taken as a part of the Home Hospital régime, it means that the children will be under the observation of a teacher or a nurse during practically all of the twenty-four hours of each day.

The Home Hospital experiment is conducted by a Special Committee of the Relief Department of the Association for Improving the Condition of the Poor, consisting of Dr. Linsly R. Williams, Chairman, Dr. Livingston Farrand, Mr. Cornelius N. Bliss, Mr. Harry Pelham Robbins, and Mr. Percy R. Pyne, Chairman of the Relief Department, as an *ex officio* member. Dr. Linsly R. Williams is the General Medical Director. The attending physician is Dr. Edward C. Brenner, who has had a great deal of experience with tuberculosis at the Bellevue Clinic under the direction of Dr. James

Alexander Miller. Dr. Williams visits the hospital frequently, and Dr. Brenner visits and holds a clinic on Monday, Wednesday, Friday, and Saturday of each week.

Miss Helen Knight Smith is the Resident Superintendent, and upon her and her assistants rests the responsibility for carrying out the details of the work and strictly enforcing all the rules and regulations. Miss Smith, a graduate of Leland Stanford Junior University, is also a trained nurse and a dietitian. She has had experience in relief work, being for a time the Assistant Secretary of one of the districts of the Charity Organization Society. In addition to the Superintendent, the resident staff consists of an assistant, who is a graduate nurse; a housekeeper and cooking teacher, who is also a graduate nurse; a visiting housewife, who, with the help of the handy man and the visiting cleaner, does all the heavy work in the homes where the mother herself is incapacitated. No mother who is ill, for example, is permitted to do her laundry work. The Superintendent, her assistant, and the housekeeper occupy apartments on another stairway in the same building in which the Home Hospital is located. Consequently, even in the middle of the night a nurse is always on call, while in the daytime and until ten o'clock a nurse is constantly on duty.

In discussing the cost of this experiment, I desire to call particular attention to the fact that the cost includes not merely the maintenance of the patients and the medical oversight incident to the care of the sick, which alone would be necessary in a hospital or sanatorium. It includes another most essential but often overlooked item—the relief, care, and treatment of the family. Broadly speaking, when it becomes necessary for the chief bread-winner in the average workingman's family to submit to the prolonged treatment of tuberculosis in a sanatorium, his care is but a small part of the total expense involved. Some one must provide for his family. But often in considering the cost of treating tuberculosis this large item is entirely overlooked. The Association has estimated that the total net cost of the experiment per family will approximate $1000 a year. This includes the cost of maintaining the family, less the family earnings, the cost of treating the patients who are ill with tuberculosis, and the cost of supervision of patients and all other members of the family. Thus far we are running within our estimate, as shown by the expenses for the month of April. Take, for example, the actual expenditure of the Shea family, one of the three families cited above. The following is the actual expense of a typical week in April:

WEEKLY COST OF SHEA FAMILY IN HOME HOSPITAL

Rent	$8.00
Food	8.41
Fuel	.25
Clothing	3.87
House furnishing	2.04
Carfare	.15
Medicines	1.16
Lunch	.04
Back debts	.35
House supplies	.35
Average cost of medical supervision per family	4.76
	$29.38
Weekly income of family	10.00
Cost to Home Hospital	$19.38

It will be observed that the cost of food in this family is at the average rate of $.20 per day per person, which, in New York City, argues either unusually good management or undernourishment, and in the case of our families we know that it is the former. The credit for the good management, however, is due to our staff rather than to the family, but we hope eventually that the family will be able to do as well as the staff. The net annual cost of the care and treatment of the Shea family in the Home Hospital at the present weekly rate will therefore amount to $1007.76.

It is interesting to compare the weekly cost of the Shea family in the Home Hospital with the weekly cost if this mother had been sent to a sanatorium, the children to preventoriums and other institutions, the father at work earning barely enough to support himself:

WEEKLY COST OF SHEA FAMILY IN INSTITUTIONS

The woman at Ray Brook	$9.34
Ralph, aged seven, preventorium	7.00
Ella, aged five, preventorium	7.00
Stella, aged two, orphan asylum	2.25
Malnutrition baby in hospital	10.50
Man supporting himself	..
Total	$36.09

The cost of maintaining this family in the Home Hospital, therefore, is $19.38, as compared with $36.09 if the family were broken up and scattered in institutions. In other words, the home treatment of this family costs $16.71 less a week than it would have cost for institutional care. The annual institutional cost would amount to $1876.68, as compared with $1007.76 in the Home Hospital. The annual cost of caring for the Shea

family in the Home Hospital is therefore $868.92 less than would be if they were sent to institutions.

For this experiment we expect to plan two "controls." The first will be a group of twenty families cared for in the usual manner in the tenements, *i. e.*, the patient remaining at home but attending the clinic and receiving visits from the clinic nurse, the family obtaining the usual quality and quantity of relief from a relief society. The second "control" will consist of another group of twenty families out of which the patients have been sent to sanatoria or hospitals for treatment, the rest of the family remaining at home, supported in whole or in part by the usual assistance of the relief society.

Every member of these two groups of families will be thoroughly examined by a competent expert, as in the case of the Home Hospital families, and the results of the examinations will be carefully recorded in the same manner as at the Home Hospital. This done, so far as the Home Hospital is concerned, no more attention will be paid to these forty families until, say, the end of the first year, as we think advisable for scientific purposes. We shall keep track of our "control" families through the relief societies, and examinations will be repeated at the end of each year of our experiment, in order that we may compare with our Home Hospital families the progress of the disease in the individuals affected, as well as the spread of the disease within the families of each "control" group. With such "controls" established, we hope to be able to increase the scientific value of our experiment and undoubtedly we shall be in a position to make a more convincing report than we would otherwise be able to write.

The experiment of the New York Association for Improving the Condition of the Poor provides, as the Charity Organization Society's experiment did not, sanitary housing as well as adequate relief, constant oversight of a nurse, and four regular visits a week by a physician who is on call whenever he is needed. These are the important factors in hospital and sanatorium treatment, and if provided in a well-regulated private household, supplemented by relief which is really adequate, they should secure results almost as good as those obtained in a hospital or sanatorium. This is frequently done in the homes of the well-to-do with very satisfactory results, and we believe there is no reason why equally, or even better, results cannot be obtained in the treatment of the poor under the plan outlined.

In closing, however, I desire to emphasize again what I have said else-

where,* viz., that this experiment is not intended to demonstrate something to take the place of hospital segregation or sanatorium treatment, but to prove that even in a crowded city—given proper housing, sufficient food, and sanitary supervision—it is possible to check the spread of tuberculosis, and to treat the disease with a reasonable measure of success. The experiment is planned as a supplement to, not as a substitute for, the hospital and sanatorium. We do not propose home treatment in preference to a sanatorium, but, for hundreds now on waiting lists and for thousands now spreading contagion in dark, dirty tenements, it is home treatment or nothing—at least for years to come. The success of this experiment would encourage the community vigorously to combat tuberculosis in the city tenements; it would impel the community to begin the combat at once; it would convince the community that it is unnecessary to wait years until sufficient hospital and sanatorium facilities are provided before attempting in a large way to eliminate tuberculosis; it should stimulate the community to forbid the maintenance of unsanitary buildings, as well as to construct those of the same high standard as the East River Homes, and there to treat persons having tuberculosis without the necessity of breaking up homes or of depriving those who are able to work of the opportunity to do so, and thus to contribute as much as they possibly can to their support.

DISCUSSION ON PAPERS BY MISS WALD, DR. KNOWLTON, DR. SHIVELY, AND MR. KINGSBURY

Ernest D. Easton, Newark, N. J.: I would like to ask if this is the same as the East River Foundation.

The Chairman: Yes, it is the same.

Mr. Easton: Whether your Home Hospital is a separate foundation?

Mr. Kingsbury: It is entirely separate. We have simply leased one section of the East River Homes which Dr. Shively has described, and this experiment I have described is carried on by the Association for Improving the Condition of the Poor. It is to be continued for at least three years.

Dr. Simon Baruch, New York: The enterprise which has just been described by Dr. Shively and Mr. Kingsbury I think marks an epoch in tuberculosis treatment, because it will be an object-lesson to the whole community, to philanthropists as well as to municipal and State authorities. When we consider that one hospital now being built over on Staten Island will cost three million and a half dollars, and that this hospital is to be simply the

* "The Survey," March 23, 1912.

last resting-place of patients who could have been cured under the management which is now being inaugurated by the Association for Improving the Condition of the Poor, the economic value of the enterprise is clearly established. While Mr. Kingsbury is very modest in his claim, calling it an experiment, I can tell you that whatever the A. I. C. P. undertakes is sure to be a success. I have had personal experience with that society. In 1890, as Chairman of the Committee on Public Health of the New York County Medical Society, I opened my propaganda for public baths in New York City. This Association sent for me on the following day, to explain to them the new method of bathing, and within one year they had the Center Market Baths built. Now, these Center Market Baths were an object-lesson which aided my propaganda, for I had been trying for eight years to persuade the mayors of New York City to furnish cleansing baths to the working-people, and they had always claimed that these people would not bathe. The Center Market Bath demonstrated that those working-people were not only bathing, but were willing to pay five cents and spend money for carfare, and yet it was a difficult matter to convince the municipal authorities.

Edward A. Moree, New York: I would like to go back to Dr. Knowlton's paper, and in doing this I want to register a protest against making up a program so that you will have to go back three or four hours in order to emphasize or criticize some particular point. When you get to the discussion, when discussion is delayed until after all papers are read, its value is largely lost because the points to be discussed are hidden in a fog of fact and rhetoric of a long program.

Dr. Knowlton, in his description of the exhibit, spoke of the new plan providing for iron castings in holding up the exhibit. Iron castings were my first experience in tuberculosis work. I cleaned out a storehouse when I first began work with the State Charities Aid Association, and nearly broke my back moving a ton or more of castings which had been found impossible for use in an exhibit. The State Department of Health of New York has adopted a plan of portable exhibit standards that works out very well. They are made of light wood, the uprights are about an inch and a quarter square, and are very much preferable to castings.

I speak of the exhibit principally to bring out my point about the arrangement of the program. I have been much impressed with the futility of coming to Washington from New York to listen to the reading of about half of a paper, and the really effective part of the program—which in my

opinion is the discussion—being left until the very last, when everybody is either leaving the hall or has forgotten what has gone before.

E. G. Routzahn, New York: Every one in a position of opportunity ought to make a systematic effort to encourage local organizations in securing a competent nurse. There are too many people now doing nursing work in our smaller cities and towns who are not trained nurses. We must offer more money. There must be a more adequate remuneration in order that we can ask competent people to give their time to this work. There should be an effort to make an appeal to a higher type of woman than sometimes is willing to take up the work. I do not mean in any sense to minimize the type of those successful women now in the profession, but that we shall go out and systematically seek to bring the needs and opportunities of the field to the attention of those who might go into it, who would respond because of their character and their education and their desire to render social service.

May I say in this connection that the Y. W. C. A., in its vocational conferences in the colleges, is beginning to do something of that kind, but they do not yet realize the social value of the work in the smaller cities. And may I add to that, also, this suggestion: that we can make an appeal to young women to take up visiting nursing work in connection with tuberculosis on a threefold basis, which will make a larger appeal than simply visiting nursing. In the smaller communities the tuberculosis visiting nurse will frequently be the only paid social worker in the town, so that, in addition to the tuberculosis visiting nurse work, she will in a sense be the executive of the tuberculosis association, and may, if she has the vision, largely shape the ideals of the community with reference to the interwoven social problems closely related to tuberculosis. Most graduate nurses do not make good visiting nurses, and very few visiting nurses make good tuberculosis nurses. Hence the need for care in selecting or suggesting nurses.

Dr. Knowlton spoke of the pathological material in the usual tuberculosis exhibit. I am glad to say that in an experience of six or seven years never was pathological material carried with an exhibit I had charge of. To me pathological material seems about as useful in educational work as patent medicine literature.

There is a minimizing of the value of lantern slides. The reason is that we have not used them in the right way. They are not merely colored pictures. There is art in using them, as there is art in using words or anything else. The trouble is that most lantern slides have been used by people who have not been taught how to use them. And it seems to me, granting

the great value of motion pictures, we ought not to take up these newer things without getting full value of the old.

In the same way about the exhibits. We have not begun to use the exhibits in most cases. We have not studied enough how to use them as a tool in order to teach the people. We have generally been satisfied if we had an exhibit and a crowd. This is not the time for me to offer suggestions. I merely want to suggest the thought that we want to study the value of this sort of thing.

Homer Folks, New York: The one thing I would say about exhibits is that, as a rule, we have not made them bear sufficiently definitely on local problems. I think the chief and permanent use of the exhibit is to enlighten a given locality, not simply on the general subject of tuberculosis,—that is important and useful and necessary, and that is comparatively easy,—but what is much more difficult is both to enlighten it and to secure affirmative action on the particular things to be done in that particular locality. That, of course, involves a substantial amount of new material in each county. It may involve new material in each city or town as we go about, and that is difficult. But at the same time I would rate as ten to one the value of an exhibit which brings out clearly the particular things needed to be done in a given locality, as compared with one that simply tells the facts in a general way about tuberculosis and the facts about the State as a whole. It is always so much more comfortable to think of 15,000 deaths in New York State than it is to think of the particular tens or hundreds in our own city or town, and it is always so much easier to escape doing anything about something that is State wide than about something which involves merely the group of people in our own particular locality. So that the point I would emphasize above all others, after organization of an exhibit in its different sections and departments, is to give it a perfectly definite bearing on the remedial problems of the particular locality in which it is to be shown.

The Chairman: I am confident that you are all agreed that the foregoing suggestion is a most excellent one. If we can bring home to the people of a particular locality, or to persons engaged in a particular trade, the serious effects of that locality or trade upon the health of the people related thereto, we have some chance of achieving substantial results. The outlook is decidedly discouraging so long as we are dealing only with generalities in conformity to the American notion that whatever is going to happen is not going to happen to us. It is only by visualizing the true incidence of tuberculosis in particular localities, or particular trades, that the propaganda for the reduction of the death-rate attains to the dignity of an applied science.

Dr. Jacobs has shown that even the statistical returns for our municipalities are more or less conflicting, and that, in all probability, in some cities at least, the actual mortality from tuberculosis is higher than it would appear to be according to the official record. One of the defects in our death classification is the neglect to use the Budapest system, which would precisely establish the incidence of tuberculosis as a contributory cause in the case of deaths classified under other terms.

Dr. Theodore B. Sachs, Chicago: To gain the universal support of a community in the fight against its own tuberculosis conditions we need a survey of said conditions, not only in the community at large, but in its component parts as well, viz., a general survey of the prevalence of the disease in the community, followed by special surveys of its prevalence in schools, factories, department stores, offices, etc. The present campaign in Chicago for examination of employees for tuberculosis is based on this principle. If we succeed in demonstrating to an employer that tuberculosis exists in *his* establishment, the foundation is laid not only for a permanent system of medical examinations in said place, but also for a material change in its sanitary arrangements. The observation of the Chairman, that we generally think of the delinquencies of the other fellow, not of our own, is true to life; it has been demonstrated time and time again in our conferences with employers that their mind generally reverts to the establishments of their neighbors when you speak of unsanitary conditions and prevalence of tuberculosis. The way to enlist an employer in the fight against tuberculosis is to demonstrate to him that a tuberculosis problem exists in *his own* place.

The paper by Mr. Kingsbury is very interesting; the experiment is important; it elaborates the system of handling tuberculosis cases in their homes without separation from the family. No matter how large is the institutional provision for consumptives in a community, home care still remains an important problem. The experiment deserves attention also from an economic standpoint, showing that handling of the entire family in right surroundings may be arranged at less expense than the total cost of handling of its individual units (adults and children) in institutions.

"Open" cases of tuberculosis, as a rule, should, however, be excluded from the province of such an undertaking. Chances of infection from an "open" case of tuberculosis can usually be only *minimized* in the home; in the majority of cases the chance of infection *cannot be eliminated.* There is the narrowness of space; the human relationship—husband and wife, parent and child, etc. You cannot create an impenetrable barrier between the

consumptive mother and child, the consumptive wife and husband. The human "side" stands in the way.

The law recently passed by the New Jersey Legislature compelling the counties of the State to make provision for their tuberculosis cases is in advance of provision of other States. The working of this law should be supplemented by a campaign for right location, right construction, and proper medical, nursing, and dietary arrangements in such institutions. It pays to have the right kind of hospitals for advanced cases. The appointment, by The National Association for the Study and Prevention of Tuberculosis, of a special committee to investigate hospitals for advanced cases in this country and to formulate a standard of their construction and management, is one of the most important steps taken by the Association. It is bound materially to change the existing conditions.

Dr. A. M. Forster, Colorado Springs: I feel that Mr. Kingsbury is to be very highly commended for the attitude he has so fearlessly taken that this new procedure is not anything to replace any of the present factors in handling the tuberculosis problem, that it is only an adjunct, and I feel that very frequently people who are interested in some particular phase of the subject often tend to give the impression that their attitude is quite different from that of Mr. Kingsbury. Certainly if this new movement is developed along the lines in which it has started and does not attempt to replace, as Dr. Sach says, the hospitals for advanced cases in handling open and active cases of tuberculosis, it will do a very great deal along educational lines.

Unfortunately, I did not hear the paper in full, and I do not know just what the speaker said in regard to employment, but it seems to me that, along those lines also, there is a splendid opportunity for educational work. If it is demonstrated in connection with these homes that the various home employments can be carried on, not necessarily by the patient himself, but by the other members of the family in a healthy, safe way, then in that way I think the educational value of this work will be proved.

In regard to the cost, unless all the various items of expense are included, the sanatorium and hospital will suffer by comparison. It is hardly necessary to say, however, that with an institution in the country, properly equipped, we can get the best possible results at the lowest cost. I have in mind a family at the Eudowood Farm Colony that illustrates my point. For a number of years they were a burden to the Charity Organization. The mother and father and two of the four children had tuberculosis. The father was the only breadwinner, and his earnings, even before he developed the disease, were not sufficient to keep the family above the poverty line.

The four members with tuberculosis were taken to the sanatorium, while the Charity Organization continued to look after the two children who were well. After a period the entire family were collected in the farm colony, where they remained for a still longer period. They now have a comfortable little home rented, the father and two boys are at work in the country, and they are more than self-supporting.

Dr. Jay Perkins, Providence, R. I.: I think Miss Wald's paper should not be allowed to pass without more comment. I think her paper was one of the best on that subject that I have ever heard. She took the most sensible view of the subject. The trouble with nursing, to a large extent, is that there is too much red tape. They do not in some places do all the nursing. I think the tuberculosis nurse should have the full care of tuberculous cases. They should not simply give them a few directions as to how they should live, but they should have the full care and sympathy of the case, and not simply go in a stereotyped way and ask a few questions and give a few directions. The tuberculosis nurse should see the patient often enough to keep in touch with his personal life. The physician can tell the patients what should be done to help them do it. For this work the nurse needs social service training or to work under a trained social service worker.

ADEQUATE HOSPITAL CONTROL

By Bertram H. Waters, M.D.
New York

The provision of sanatoria for those tuberculous invalids for whom cure or considerable improvement may reasonably be expected is, or promises soon to be, adequate. Everywhere the greatest interest and activity are manifest in this phase of our anti-tuberculosis problem, while the proper care of advanced stages of the disease receives scant attention. That this should be so is perhaps natural. The sanatorium accomplishes brilliant results, it presents an opportunity for recovery, the desideratum of physician and patient, while both feel that to those with well-advanced disease the hospital has little to offer. It is unfortunate that this attitude, and the popular interest in sanatoria, has led to neglect of this type of patient, and that the great importance, from the standpoint of prevention and sanitary control, of caring for these sources of infection is not more fully realized.

All our efforts for prevention, especially those of the last decade, have, with ever-increasing assurance, demonstrated the urgent necessity for the proper management of "open" stages of the disease, and segregation, for such patients as are dependent, is not only indicated as the only sure and safe measure, but also is meeting with less sentimental opposition. In our large cities, where the enforcement of such a measure is most needed, lack of adequate hospital accommodation for these patients has retarded the development of public sentiment in its favor, and made impossible its accomplishment even in a minority of instances. There are, as a rule, too few beds to accommodate those who would willingly accept hospital care. New York City has at present 2635, to which during 1911 there were 16,901 admissions, representing at least 12,500 different patients. Of these, 5705 were homeless and 50 per cent. of all applicants could be placed only upon a waiting list. It is apparent, then, that for these patients with advanced disease, of whom the majority, at least, require and would gladly accept hospital care, no immediate or adequate provision can be made. Even when the hospitals contemplated or in course of construction are available,

there will still remain a probable shortage of 2500 to 3000 beds. In other words, there will be in their homes, for the most part already unsanitary enough, this number of tuberculous persons who have or will have bacilliferous sputum, and are therefore the sources of infection of those about them. While popular education is accomplishing much in inducing such consumptives to take proper precautions to prevent this, we cannot, and probably never will entirely, succeed in making them as a class careful and therefore safe. Failure to provide adequately for them seems to be false economy and needlessly to defer the realization of our hopes for the eradication of the disease.

That New York is not unique in this respect is shown by the following table:

	Hospital Beds	Total Tuberculosis Deaths*
New York †	2,635	10,127
Chicago ‡	695	3,908
Philadelphia ‡	664	3,371
Baltimore ‡	260	1,404
Boston ‡	585	1,379
Saint Louis ‡	202	1,275

It is interesting to note here that to a very recent questionnaire on this subject the health officers of Chicago and Philadelphia replied that they had no data as to the number of hospital beds for the advanced stages of pulmonary tuberculosis, in their respective cities.

For adequate hospital control there is required, not only sufficient hospital accommodation, but also authority for compulsory removal. All cities and towns which, by sanitary ordinance of the proper health officers, have declared tuberculosis to be a reportable and communicable disease, have, or should have, this authority and, under proper conditions, should exercise it. There are many patients, who should be in a hospital, who obstinately refuse admittance thereto, and who frequently are notoriously indifferent in the observance of precautions and to the welfare of those about them, in their own unsanitary homes or elsewhere. These should be compelled, by force if necessary, to enter a hospital and should be detained there, permanently if possible, or certainly until there is good evidence that they are themselves amenable to sanitary regulations, and that they can be properly cared for by those upon whom they are dependent. This procedure

* Bulletin 109, Bureau of the Census, Mortality Statistics for 1910.

† Ascertained by a questionnaire sent out this year by the Committee on the Prevention of Tuberculosis, of the Charity Organization Society.

‡ Estimate made by The National Association for the Study and Prevention of Tuberculosis, for 1911.

was adopted by the Division of Communicable Diseases of the Department of Health of New York in 1905, and no question as to its propriety or legality has been raised. Frequently, however, there has been no room, even for this class of patients, in the Department's hospital, Riverside, where only, under the present system, they may legally be detained. Whenever this authority has been exercised, removal has been justified by the following conditions, which inspection has verified:

1. Tubercle bacilli present in the sputum at a recent (six weeks) examination.
2. Lack of observance of sanitary precautions.
3. Unsanitary condition of the home.
4. Helplessness, or dependency upon the family of the patient.
5. Presence of others in the home, especially children, exposed to infection.

These requirements, however, are not sufficiently stringent, are not applicable to many patients who should be under control, and rest upon the unscientific assumption that a patient with non-bacilliferous sputum is negligible as a source of infection. It is highly probable that the absence of bacilli is frequently the result of a too hasty and incomplete search, and that the newer and more refined methods of examination will demonstrate their presence in a great number of instances, and it is certain that the "closed" lesion may at any moment become an "open" one. Moreover, the experience of social service and charity workers, whose aid is an indispensable factor in the tuberculosis problem, testifies to the frequency with which the financial burden of the patient at home demands the labor of the wife or children, or, even with this, forces the family to seek charitable aid. When there is added to this miserable situation drunkenness of the patient, or the violence and drunkenness of the husband when the wife is the patient, it becomes intolerable. It is contrary to all economic and philanthropic standards that, under such circumstances, the patient should be left in the home, and that either public or private funds should be employed to maintain it.

The most advanced legislation in regard to this matter was recently enacted by the State of New Jersey. It provides that, within six months from April 1, 1912, all counties shall make provision, in special institutions, for the care of tuberculous persons. It further provides that a subsidy of three dollars a week shall be granted each county for each of its dependent residents so maintained. This legislation is further so adequate in the

extent of authority conferred upon State and municipal health officers as to justify quotation of the following paragraphs:

9. It shall be the duty of the State Board of Health, from time to time, to make rules and regulations for the care of persons suffering with tuberculosis, and for the prevention and spread of that disease; these rules shall be published and copies thereof sent to each board of health and to each practising physician within the State, on or before the first day of April each year, and to such other persons or societies as may request the same, and in such quantities as desired. The duty of enforcing said rules and regulations, and seeing that they are enforced, shall be upon the State Board of Health, for which purpose the State Board of Health may issue orders to local boards of health and practising physicians.

10. It shall also be the duty of every local board of health to enforce said rules and regulations.

11. If any person fails to obey any of the said rules or regulations, the offender may be committed to the county hospital by any judge of the Court of Common Pleas, upon proof of service upon the offender of said rules and regulations, and proof of violation thereafter. The court may also make such order for the payment for care and treatment as may be proper. After commitment such person may be discharged by the said court at any time when said court thinks it proper so to do.

12. Any person so committed to such county hospital who fails to remain there, or who neglects or refuses to obey the rules and regulations of that institution, may, when in the judgment of the superintendent it is necessary, be isolated or separated from other persons and restrained from leaving the institution.

The only other State which provides for compulsory segregation of tuberculosis is Maryland. The only cities in the country which have adopted ordinances providing for compulsory removal are Grand Rapids and San Francisco. A few others, like New York, exercise this power under certain provisions of their sanitary codes, but none has a special ordinance on the subject.

Adequate hospital control of advanced or "open" stages of pulmonary tuberculosis cannot be attained without—

1. Sufficient hospital accommodation.

2. The enactment, if necessary, of special legislation conferring upon State and municipal health officers authority for compulsory removal and detention.

3. The exercise of this authority whenever—

   a. There is refusal to comply with sanitary regulations.

   b. Unsanitary home conditions exist.

c. The patient is of vicious character and habits.

d. Others, especially children, are exposed to infection.

e. The patient, or the family, are public charges or dependent upon charitable aid.

Provided that these conditions have been verified by inspection, and, if tubercle bacilli are absent from the sputum, the diagnosis has been confirmed by two competent examiners.

4. The permanent detention of these patients in a hospital.

5. An energetic attempt, by every one interested in public health, to persuade all patients of this class to enter hospitals, and to educate them as to the value of this action as a preventive measure for those in their homes.

The first of these conditions, as stated, purposely leaves open to discussion the question of the number of beds which may be considered sufficient. This must depend largely upon the demand and upon the local conditions. There are those who maintain that, by reason of the moral and educational influences brought to bear upon patients while in the hospital, as well as from the prospect that they may be enabled thereby to resume their places as economic factors in their community, it is better to so maintain, for example, three such patients for two months each than one for six months; in other words, that there are some advantages in the drifting of such patients in and out of the hospital and their homes. When we consider that we must provide for a class of persons who rarely obtain permanent improvement, who usually are dependent, and who frequently are homeless and depraved, there can be no question as to the necessity of adequately providing for them permanently. Inasmuch as universal segregation, ideal though it may be, is as yet impracticable, there must also be provided accommodation for the transient care of a considerable number of a morally better and perhaps more hopeful class who do improve, and who have a home and relatives or friends willing and able to care for them properly. Such patients, in many instances, might be sent, after their hospital course, to a sanatorium, with benefit to themselves and with profit to the community.

The authority to exercise control over patients with advanced disease who are dependent, and to remove them to a hospital, if necessary, should not rest alone upon general sanitary ordinances, but should be enacted by special legislation and made legally valid. This legislation should be broad enough to enable the proper health officers to act, without hindrance, according to their discretion.

The conditions justifying compulsory removal, as stated, do not seem to

be debatable, except possibly that of dependency. It may be suggested that maintenance at home, with home treatment, by charitable aid is justifiable in many instances. When neither of the first three conditions is present, possibly this may be done without danger, but it will always be at an economic loss and with a diversion of funds from others who might derive greater and more permanent benefit from them.

Since failure to demonstrate the presence of tubercle bacilli in the sputum may make the diagnosis of pulmonary tuberculosis honestly questionable in certain types of the disease, or may give an opportunity for dishonest or interested denial of the diagnosis, the authority of health officers should be interpreted to be decisive and final in such instances when two of their examiners, who are competent to decide, agree in their findings.

Compulsory removal without the facilities or authority for detention is useless.

It is gratifying to those unselfishly interested in public health matters that patients, however invalided, unable to provide themselves with proper care and comfort in their homes, are becoming less averse to entering hospitals. This attitude should be encouraged, especially for the tuberculous, and the most effective means of allaying their apprehension, of really giving them better care and of encouraging them to remain in it, will be the provision, even at a cost above that of the present, of modern wards, good food, and efficient, sympathetic attendance. Too often we are short-sighted in our ideas of hospital economy, and indifferent in the selection of our hospital attendants.

There are few persons, except those who are depraved and vicious, who may not be influenced through their affection for, and concern in the welfare of, those near and dear to them, and this sentiment should be developed by our social service workers and nurses, to the end that hospital control, the most efficient of all preventive measures, may be willingly and fully accepted.

DISCUSSION ON PAPER BY DR. WATERS

Frank E. Wing, Chicago: It would seem unwarranted assumption on my part to attempt to discuss in any way the medical aspects of Dr. Waters' admirable paper. The reliability of the present known methods of discovering tubercle bacilli in the sputum of an infected individual, and the attitude which should be taken toward the tuberculous patient with non-bacilliferous sputum, as well as the standard of care and treatment of the patient, both in the hospital and in the home, are medical matters, and as such should not be discussed with any attempt at authority by a layman.

There are physicians present who are ably qualified to handle this side of the subject.

Dr. Waters has said that adequate hospital control requires not only sufficient accommodations, but also authority for compulsory removal. He has stated, at the close of his paper, that there will be less aversion on the part of patients toward entering hospitals if they are given better care and treatment while in them. It seems to me that herein lies the chief weakness in the present agitation for compulsory removal. I note that the New Jersey law, which has been quoted, imposes stringent duties upon counties for the provision of county hospitals, and equally stringent duties upon health officials for the removal of patients to such hospitals; but I find nowhere in the law any requirements as to the standards of care and treatment under which those hospitals shall be operated. I hope, before the end of this discussion, that we may hear from Dr. Sachs on this subject. Dr. Sachs has for the last fifteen years been fighting the cause of the advanced consumptive in Chicago. On his recommendation the Chicago Tuberculosis Institute early this year submitted a platform to candidates for nomination to the office of County Commissioners in Cook County, calling for better care of consumptives in the county institutions, and asking each candidate to bind himself by this platform in the event of his election. At Dr. Sachs' request The National Association for the Study and Prevention of Tuberculosis has appointed a committee to investigate the standards of hospital care in the United States, and has further recognized his interest in the subject by appointing him chairman of that committee. I shall leave further detailed discussion of this important phase of the question to Dr. Sachs.

I am heartily in accord with Dr. Waters on the fundamental proposition that the full control of the tuberculosis problem demands the power of compulsory removal. What shall be considered a valid cause of removal, how often this power should be exercised, and whether the removal of all sputum-producing individuals diagnosed as tuberculous and not under absolute isolation (which would seem the only logical procedure in view of the frequently fluctuating "open" and "closed" condition in the same person) can be justified on the score of economy and rights of the individual, are matters in which there would seem to be still room for difference of opinion.

Assuming that the power of compulsory removal is essential to the successful carrying out of the campaign of prevention, what can be considered a valid reason for exercising this power? Dr. Waters says that removal of patients in New York has been justified by—

1. Tubercle bacilli in the sputum.

2. Carelessness or indifference of the patient.
3. Unsanitary condition of the home.
4. Helplessness and dependence of the patient.
5. Children or others exposed to infection.

If he means that all these conditions were present in every individual case of removal, I would agree that they constitute a sufficient reason, because there can be no doubt that they would be a menace. Taken singly, I cannot agree that some of them would or should be considered a sufficient cause. Should the presence of tubercle bacilli in the sputum be recognized as a sufficient cause for removal? I should say that it would not. Can the unsanitary condition of the home be considered sufficient cause? I would say, let us, in this case, use compulsion to remove the home condition rather than forcibly remove the patient. Should the fact of dependence be taken as a reason? I should say again that, as a reason by itself, it should not. We have no right to legislate against a consumptive because he is dependent. This would be advancing arguments which no court of justice would recognize as valid. We all know that courts of justice are slow to act when individual rights seem to be infringed upon. Experience has shown in similar cases that the individual must be proved to be a menace, and that the remedy proposed is sufficiently practical to accomplish the results desired, namely, the protection of the community. It matters not whether the individual be rich or poor, independent or dependent, the only valid reason for the compulsory removal and retention of a tuberculous individual would seem to me to lie in the question of fact, namely, *Is the patient willingly or unwillingly, ignorantly or viciously, exposing others to infection?* I believe all other considerations are mere attendant circumstances, and that they should not be allowed to confuse the main issue. A person capable of self-support is able to do just as much damage as the person who is an object of charity, and often more damage because of his ability to associate more freely with other individuals.

Given such power as we have under consideration, and given, what is even more important, attractive, well-managed, and home-like institutions, separated in the public mind from the idea of the almshouse or county poor-farm, I believe it will be necessary to exercise that power very infrequently. It will serve as an efficient club to be used as a last resort, but in the majority of cases, except with the vicious class, education and the kind persuasion of the doctor and the nurse will accomplish good results.

Most municipalities have already more power in this direction than they exercise. New York City is exercising this power, as Dr. Waters has stated,

to a considerable extent, the chief difficulty being the limitation caused by lack of facilities for caring for this class of patients. Chicago has an ordinance, of some thirty years' standing, which gives the City Health Department authority and police power forcibly to remove cases of contagious disease that have become a menace to a distance not to exceed three miles beyond the city limits, and to provide for the care of such patients in suitable quarters. But while the Health Department has the power to remove such patients, it does not have the place in which to keep them. I can cite several instances where this power has been exercised during the past two years by the removal of patients to the County Hospital, but in all but one instance the patients discovered that while the city could remove them to county institutions, the county had no power to keep them there and they promptly went back home. The question then naturally arises, would it be advisable to extend the existing police power of our departments of health to other governmental bodies, or should the facilities of those bodies already possessing police power be increased, and their powers extended, if necessary, to enable them to carry into effect the authority which they now evidently possess? I am inclined to accept the latter solution as the most satisfactory.

In this connection I may add that even with the granting of full power of removal, there will still remain one difficulty in the way of determining the infectious character of the disease. With a knowledge of the purpose of existing authorities to enforce their power of removal, it is quite natural that the patients themselves will seek to hide the identity of their disease. Since the only absolute guarantee of the infective character of the disease lies in the presence of tubercle bacilli in the sputum, should not there be placed in the hands of the authorities the right to enforce suspected patients to submit samples of sputum for examination? Otherwise the law will lose materially in its effect.

I have spoken chiefly on matters relating to the power of compulsory removal. One further adjunct to adequate hospital control, which seems to be very necessary and important, lies in a direct means of supervision over patients in their homes. This would best be accomplished by effecting a close relationship between the hospital and the tuberculosis nursing staff of the city. Much of the responsibility for inducing patients to enter the hospital, as well as the supervision of discharged hospital patients, will rest upon the nurse. In order to make her work most effective there must be a close coöperation between the field nursing force and the hospital itself. I believe the policy of the Boston Consumptives' Hospital and the Chicago Municipal Sanitarium Boards in creating a dispensary or out-patient de-

partment as a part of their respective working machinery is the closest and most satisfactory relationship that can be established.

George J. Nelbach, New York: A potent argument in favor of the compulsory removal and detention of tuberculous patients lies in the fact that public officials will prove more responsive to appeals for the establishment of institutions. Our experience in New York State, where county boards of supervisors are authorized to establish county hospitals for tuberculosis, is that one of the very first questions these office-holders ask is, "Well, can you make these people go to the hospital after it is built?" We have to say, "No." Then the rejoinder is, "Well, what guarantee have we that the patients will go to the institution?" All we can say then is that they will go if it is made attractive and inviting and is well managed and well administered. But this reason is not always enough to induce affirmative action.

I do not agree with Mr. Wing that the argument for compulsory removal is weakened because no agreement as to what are proper standards of administration of hospitals for advanced cases has as yet been reached. Provide the hospitals; segregate the cases that clearly need to be segregated. The ascertainment of what are proper standards of administration will follow in due course. My judgment is that legislation looking toward compulsory removal is sound and necessary, and I believe many States and municipalities will follow the example set by New Jersey.

With reference to the various conditions justifying the exercise of compulsory removal, I agree with Dr. Waters in all those he sets forth but one. It seems to me the fundamental test is this: Will the continuance of the patient in his living and working conditions be a menace to the health and lives of the people who are living and working with him, and to the public? The fact that the patient may be of vicious character and habits, that unsanitary conditions may exist in the home, that there may be children in the family, are only attendant circumstances; they are only matters of evidence in reaching the conclusion as to whether the continuance of the patient in the home and where he is employed means that he will be a source of danger.

I am not quite clear that the dependency of the family should be a reason for the exercise of compulsory removal and detention of the patient. This is where I disagree with Dr. Waters. Mere dependency of itself, I think, is not enough. It is quite a serious matter to break up a home. I believe that dependency should be considered as evidence in determining whether the continuance of the patient in his present surroundings is dangerous.

The exercise of the power to remove must be very carefully considered

and invoked only where the case is quite clear. We have been telling the people for several years, through literature, newspapers, exhibits, lectures, and other propaganda methods and channels, that the careful consumptive is not a menace to his fellows. Now if we are going to put into effect a law permitting consumptives to be forcibly taken away from their homes and put in institutions if the case is not absolutely a clear one, we will be accused by our friends all around these States and counties and cities of not knowing our own minds. A careful consumptive, we are told, is not a source of danger to his fellows, and I believe that some dependent consumptives can be taught to be adequately careful without being forcibly taken from their homes and placed in institutions.

I also believe in the detention, in institutions, of the persistently careless, dangerous cases. Without it, compulsory removal would be of little avail. We are all familiar with the so-called "hospital rounders." I recently came across one case which shows how urgent is the need of legislation for detention. This was in a county hospital. An advanced case who was also an alcoholic had been placed in the institution. He was a vicious case, and he had a bad effect upon other patients in the institution. He ran away one day and was brought back in a very befuddled condition and caused an uproar. He was discharged because he could not be locked up, and he went down town to his home. His people did not want him there. Through some influence an order was secured from the County Superintendent of the Poor for his admission to the almshouse and he went there. The keeper of that institution said that he did not belong there. He was transferred to the tuberculosis hospital, and he went through the same performance twice. Patients like these need to be restrained. The mere fact that they can be detained in the institution is bound to have good disciplinary effect on the other patients.

New Jersey is to be congratulated for its advanced position in legislation. When I first heard that a mandatory law had been passed requiring all the counties to build institutions within a certain time, I questioned the wisdom of what had been done, for I know that mandatory laws do not always "mand." I recall the experience of a State Commission in New York State with the officials of a certain county. The Commission had been trying for three years to force the county to rebuild or repair an old jail. Eighteen months ago we went there and persuaded the county Board of Supervisors to build a tuberculosis hospital. The site has been purchased and plans are now being prepared, while the State Commission has made but little progress over that of three years ago. "Show cause" orders and mandamus pro-

ceedings and declaring the members of Boards of Supervisors in contempt of court have resulted as yet in no action looking toward the repair of the old jail or the building of a new one.

However, I find in the New Jersey law a provision whereby the State may grant a subvention of three dollars per week per patient to the county hospitals. This may make the county officials more disposed to act. At any rate, the situation in New Jersey will be most interesting and carefully watched. We will anticipate getting soon a report on the action of the several counties relating to the observation of the mandatory provision of the law as regards the establishment of county hospitals and also a report on the workings of the provision for compulsory removal and detention.

Frank H. Mann, New York: This is a matter in which I am very much interested. I feel that it is the most important part of our campaign against tuberculosis. It does not seem to me that we can ever adequately prevent tuberculosis until we have adequately controlled it from the hospital point of view. I think that every person who now dies in a tenement house, with very few exceptions, ought to die in a hospital, and that he ought to be in that hospital from six to twelve months before he dies. I do not believe it is possible to educate our tenement-house population, except a very small percentage of them, so that, as they approach the end and become weakened by the disease, they can adequately care for themselves so as to avoid being a source of danger to their relatives and friends.

It seems to me that we are ready now to step forward in the compulsory segregation of tuberculosis patients of a certain type. In the city of New York last year 15,000 admissions were made to the 2600 beds in that city. Of those 15,000 admissions, 12,000 were separate, individual patients. They remained in the institutions only a little over two months each on the average, and some of them did not remain that long. We have found records of homeless men who have been in the hospitals of New York City twelve times in twelve months. They can come when they please and leave when they please. They leave to go wherever they will—into the tenement homes, into the lodging-houses, to ride in the public conveyances, to spit on the street, and generally to spread the disease. Of this type of patients we have in the city of New York, according to the figures given me by the Health Department this spring, not less than 5000 homeless persons who are each year admitted and discharged from the hospitals in that city, except the few who die in the institutions. Now, it seems to me that we are ready to take the stand that all persons without homes, and who have neither present nor potential means of support, should be put into the tuberculosis

hospitals and kept there, because they are a source of tremendous danger to the community.

I want to give you one figure that Dr. Waters did not mention. I do not think that Dr. Waters meant to leave the impression that New York City had really done any great amount of compulsory removal. I am told that they remove about thirty-six cases every year. After the patient has been in the hospital a short time and the home conditions are cleaned up, and the man promises to behave himself, they let him go back. Most of them are not detained very long.

Dr. Theodore B. Sachs, Chicago: I will touch upon what seems to me to be a very important condition connected with the administration of a compulsory removal law. The paper of Dr. Waters is valuable and interesting; the discussion by Mr. Wing brings out important points; I agree with Mr. Nelbach in all that he said, with the qualification that the patient himself is an important factor in timely hospitalization of advanced cases. On one hand, there are advanced consumptives, whose very appearance and outward symptoms suggest the presence of the disease; on the other hand, in a large number of "open" cases of tuberculosis the appearance is that of apparent health and the patient may easily conceal the existence of the disease.

To render a compulsory removal law effective we must gain—(1) The confidence of the tuberculous patients by operating hospitals well located, rightly constructed, and rightly managed, hospitals to which the sensible patient will gladly go and where he will gladly stay; (2) the confidence of the community in the existing hospitals, which is essential to their support of the policy of forcible removal of careless consumptives. It pays to have the right kind of hospitals; the expense of maintaining them is much less than the loss sustained through the infection of entire families by consumptives remaining in their homes.

Homer Folks, New York: I simply wish to ask a question. As a lay worker on the hospital question I find myself floundering somewhat. It seems to me that we have received somewhat contradictory advice from our professional advisers, to whom we must look for guidance. We are very much impressed by the figures which Mr. Mann gave about the homeless men who go out and in of hospitals as they please and spread contagion. We are also very much impressed by the needs of the man who has a home, who has a wife and children, who are likely to be infected by him unless he can go to a hospital. But whichever one of the two things we leave undone in caring for this or that class, we are shortly brought up with a round turn by

the suggestion that we are not doing the most important thing. If we were to specialize in providing for the homeless men in New York who go about spitting on the streets and living in the lodging-houses, we should not be able to provide for any of the men who have homes, wives, and children, and who live in all the intimacies of household life, for many years to come. The army of 5000 homeless men to be detained forcibly or otherwise would occupy our hospital building capacity for a long while. Now, which is, after all, the more important? I confess that it has seemed to me, in reading the material put forth on the subject and in turning the matter over in my mind, that we have at times overemphasized the danger of the homeless men, as compared with the danger arising from the man who has a home. Isn't it the trend of opinion that infection is passed on in the intimate relations of household life and in continuous and intimate association between the head of the household and his children, rather than in those uncertain and infrequent and comparatively slight contacts, such as occur in case of the homeless man? Do not these germs that are deposited upon the street die off pretty promptly? If the homeless man lives in the open air, he has taken good advice to this extent, at least, and during the summer season he traverses the country districts, practising the strictest rules of hygiene as to outdoor living and sleeping. Is he, after all, so very dangerous? I am disposed myself to feel that the man to provide for, from the point of view of diminishing infection, is the man with the home, rather than the man without the home. The probability of the latter passing on the disease in his comparatively isolated career seems to me to be much less than that even of the well-meaning man who is fondling his children in his own home. But I would like to be shown.

Ernest D. Easton, Newark, N. J.: I also would like to ask a question. New Jersey has passed a compulsory removal law, as Mr. Mann has spoken of, but the State Board of Health must formulate some rules covering the kind of patients that can be removed. The question arises, What rule shall they formulate? Shall it be the homeless man, shall it be the careless man, and who is the careless person? Is it the one who spits about carelessly? Is it the one who sleeps with another person? Is it the one who does not keep his windows open? What specific rule can you formulate of a careless man that may be removed to a hospital? I say that New Jersey has to face this situation, and until we do formulate rules, absolutely nothing can be done. We shall not have the authority to remove a man whom we know positively is infecting his entire family until some specific rule is formulated

by the State Board of Health. I wish that some of our learned men here would answer that one question.

In regard to the question of who is more dangerous, the man with a home or the man without a home, I would like to give you some figures of cases which we have had in our office. Thirty per cent. of all the cases which we have dealt with have had some tuberculous infection in the family; that is, they have had some tuberculosis history; while of these same cases only 5 per cent. have been in houses where tuberculosis has occurred within the past nine years. Whether that information is worth anything I do not know, but I should say that it would indicate perhaps that infection is greater from the family than it is from the house.

S. P. Withrow, Cincinnati: I am sorry to say that conditions in Cincinnati about the time of stay in the hospital are much the same as they are in New York. I do not know what the exact figures are, but we have a string of people coming and going from the hospital all the time. The hospital reports cases coming to and going from that institution to the dispensary twice a week. Some cases have been in and out of the hospital as high as nine or ten times. Of course, we follow up the cases sent out from the hospital and try to get them in the dispensary, but they usually give false addresses. We are trying to control this, and have selected a Director of Social Service who will be used as a go-between between the hospital and the patient, and we hope to bring about better conditions. She will be a trained nurse with experience in visiting—a very tactful woman. She will come to this institution, and the institution will provide her with room and board, and the Anti-tuberculosis League will pay her salary. She is supposed to know every patient in the institution, and to receive every one coming in, and tell them that she feels they have come to the right place for a cure, telling them at the same time that if they have any grievances or any complaints they can report them to her and she will act for them, both at the home, through the dispensary, and through the administration of the hospital. In this way, as a go-between between the patients and the hospital authorities, we believe we can bring about a better feeling of harmony. As it is now, there is a spirit of alinement of the patients, on the one hand, making complaints, and the administration not knowing much that is going on in the institution. Now, in our 1638 reported cases in Cincinnati last year we find many coming from fifteen- to twenty-five-cent lodging-houses as group centers.

Dr. John H. Lowman, Cleveland: There seems to be a division, as there is on all great questions, between the doctrinaires and the opportunists.

We can all get together on one point, that the infectious center should be stamped out, and it will only be stamped out by placing the patients in the hospital and teaching them to take care of themselves. The opportunists say that it is impossible to stamp out all these infecting centers; that you cannot educate all the people, or house all the cases. Which ones will you take care of? That question will be a different one for every community, and I think every place will have to work it out for itself. In smaller communities I fancy it can be done by home visitation, visiting nursing, and instruction. The larger the community, the less effective this will be, because there is a more floating population. The homeless man is, I think, more of a danger than perhaps we think. It was shown in some statistics of Vienna, I think, three or four years ago, that in the lower quarters where men were taken in to board in poorer families the percentage of tuberculosis was very much higher than in other places, and they attributed it to the daily boarder, and that, according to their statistics, crowded up the lower average very much. Which one is to be restrained? I am sure I do not know. I think here is the great point of the opportunists. It is not necessary to restrain everybody. In leprosy it was observed that the detention of 30 per cent. of the lepers in hospitals caused a marked reduction. With tuberculosis I fancy that the restriction of 60 per cent. will cause a decrease. With small-pox and cholera 100 per cent. must be restricted. The number to be restricted depends upon the virulence of the infection. I think that idea is not sufficiently emphasized.

ADEQUATE CLINIC CONTROL

By F. Elisabeth Crowell
New York

The recognition by the medical conscience of a social responsibility, and by the social conscience of a medical responsibility is a phenomenon of recent years. The net gain to the community as well as to the individual is writ in large figures. One result has been the evolution of the special tuberculosis clinic where home supervision of its clientele ranks equally in importance with the dispensing of medical advice and treatment. The movement was at first sporadic and unorganized. The tendency of the medical profession toward specialization in private practice began to be reflected in dispensary work. The general medical clinic was made to yield up its eye patients, its skin patients, its heart patients, and its tuberculosis patients to special classes. With a more intimate knowledge of tuberculosis patients thus made possible came a realization of the necessity of extending the work of the dispensary to the family if any lasting result was to be accomplished. The educational possibilities of tuberculosis clinic work were realized, and by means of the clinic nurse the gospel of prevention was carried into the homes.

That the special tuberculosis clinic is an essential factor in any scheme looking toward the effective control of tuberculosis would seem to be axiomatic. I am therefore assuming that further demonstration of this fact from a layman is unnecessary. To accomplish the full measure of its usefulness, however, a clinic must be securely tied up with other agencies furnishing treatment, whether medical or social, and it must have a good strong grip upon the people it is to serve.

METHODS OF ADMINISTRATION

Before proceeding to consider the methods of organization by means of which we in New York have come to feel that we have secured a fair measure

of clinic control, it may be profitable to discuss briefly some details of clinic administration. Granting that the functions of a tuberculosis clinic are to diagnose, to treat medically, to supervise, to distribute to institutions and to educate, the efficiency with which a clinic fulfils these several functions will depend, first of all, upon an adequate staff of physicians and nurses. This means a sufficient number of physicians to give careful attention to each individual patient visiting the clinic, and, when necessary, to visit in their homes patients awaiting admission to hospitals and cases unable to attend clinic because of the presence of temporarily acute symptoms or other causes. It also means a sufficient number of nurses to carry out an effective follow-up system, to maintain adequate home supervision, to secure intelligent social treatment when necessary, and to give actual nursing care to those bed cases for whom it is not possible to secure institutional care.

One of the strongest arguments used for taking the tuberculosis patient out of the general medical clinic has been that he will get specialized attention by physicians in the tuberculosis clinic where the searching inquiry into past history and present environment, coupled with more thorough and painstaking physical examination, will result in a far more accurate diagnosis of doubtful cases. Over 7000 cases were discharged by the New York clinics last year as non-tuberculous—nearly one-fourth of the total number examined. Unquestionably much more time and effort was required to determine that these cases were not tuberculous than to diagnose many of the positive cases whose physical signs were so plain that "he who runs may read."

It should also be possible to re-examine the old cases periodically. It may be a bore to the physician, but it is mighty good for the patient. He knows that he is being watched, and the knowledge makes him feel that it is worth while to keep up his attendance at the clinic and to carry out the advice that is given him. The willing co-operation of the patient will thus be secured and held, and the clinic's control strengthened manyfold.

MEDICAL TREATMENT

For this same reason the psychological effect of the medication administered is well worth considering quite apart from its therapeutic effect. A good many of us are still in the bread-pill stage, medically speaking, where it helps mightily to be taking something, and it will help the clinic to hold the patient if he is getting this something there. It may be internal medica-

tion, it may be tuberculin administered hypodermically, but the patient is being treated as well as talked to.

As for the professional attitude on this point, I cannot do better than quote from a recent article by Dr. Waters, Assistant Chief of the Division of Communicable Diseases of the Department of Health of New York. Referring to the tendency of many clinic physicians to "mark time" until the patient can be admitted to an institution, he makes a strong plea for the use of those helpful measures formerly recognized as beneficial, but which are too often overlooked in the present emphasis laid upon the necessity of securing sanatorium treatment. During this period of waiting he says: "An effort should be made to select the general tonic best suited to each individual. There is still virtue in iron and arsenic and strychnin, and the oils and fats are still good flesh producers. . . . The treatment of special symptoms is not a hopeless problem. The old-fashioned remedies do relieve cough, and even night-sweats and hemorrhage may often be benefited by simple vinegar sponge-baths or an attempt to repair demineralization by calcium salts. . . . Finally, since in this malady psychotherapy plays so important a part, above all, confidence must be established between the patient and the physician and the patient's own interest in curative measures must be awakened. . . . The patients must be made to feel that something is being done for them, or we will fail entirely in holding their interest and attendance."

HOME SUPERVISION

And when the physician shall have given of his best, the work of the clinic is only half done. In no other disease is the ultimate result so entirely dependent on the full, intelligent, persistent co-operation of the patient. You can put a broken leg in a plaster cast and harness the patient to a bed with straps and weights and pulleys, and practically assure a sound, well-set leg as a result of treatment. You can restrain a typhoid patient during the dangerous period of delirium and watch him carefully through the treacherous period of convalescence, because typhoid is a self-limiting disease which will terminate one way or another within a reasonable length of time; but you can neither watch nor restrain for months or years a tuberculosis patient through slowly progressive stages of the disease or insure his remaining an "arrested" case by locking him up for safe keeping.

This education of the patient and his family to the point of doing his

share, both for his own sake and for the sake of protecting others, must be carried on by the nurse in the home. The whole family must be brought within the radius of clinic influence. Other members must be examined, new ideals of hygienic living must be inculcated, and the realization of these ideals must be made possible. Medical treatment must be supplemented by social treatment. In order to give the other members of the family a fighting chance, it may be necessary to effect a complete readjustment of family conditions, readjustment even to the point of dissolution. It requires insight, a quickened social conscience, to sense the necessity for these readjustments; wide knowledge of social resources, experience, and infinite tact to accomplish them.

SOCIAL TREATMENT

Not all nurses engaged in tuberculosis work are alive to the social responsibility entailed in their handling of the families with whom they come in contact. Dr. Cabot has said that the training of a nurse is inimical to certain indispensable qualities which a social worker must possess; yet the knowledge of a nurse is most valuable to any medical social worker. It is clear that if we do ignore the social factors involved, our supposedly adequate clinic control will be but a sorry jest.

I am reminded of a young Italian widow, an early second-stage case, whose husband had died of tuberculosis. There were two small children, one of whom had already developed suspicious signs. The woman rented two tenement rooms, one of which she sublet. The other, where she cooked and slept with the children, was the "home" which she passionately refused to give up. So two good and sympathetic nurses, one at the clinic, the other at a day nursery, were doing their level best to aid her in keeping her home together; the one, by having her admitted to a day camp, the other by caring for the children all day in the nursery. Thus it was made possible for them all to be together at night. The rub came when a relief organization was asked to help out with the rent and justly refused to make possible the continuance of conditions at variance with the best interests of all concerned. It was unquestionably hard upon the mother to require her to give up her children even temporarily and enter an institution, yet it was her best chance for recovery. It was certainly not giving the children a square deal to allow them to be exposed nightly to the danger of infection.

It is a large question whether tuberculosis nurses should be expected to carry out the detail of the social treatment of a family, involving as it does so many considerations, so much time, and a certain experience and training which they have never had. A few there are who can qualify as social workers of the highest order, but at present the greater number will undoubtedly serve the best interests of their patients if they call upon the trained, experienced social worker to treat the social needs of the patient and his family.

Successful co-operation between social agencies and the clinics in the treatment of tuberculous families is going to depend primarily upon two things: First, a wider, deeper conception on the nurse's part of the social aspect of disease and its consequences; second, on the getting together of the nurse and the social worker, in order that any final plan of treatment may be based upon the combined knowledge and experience of both. I am laying this special emphasis on the social treatment of tuberculosis because I believe that only by developing this phase of the work intensively will the clinics ever succeed in adequately controlling the spread of tuberculosis. We can advise, we can treat medically, we can visit, we can educate our patients and their families, but we must make it possible for them to put our preachment into practice by showing them how, and supplying them with the necessary means in such a way as not to weaken the fibre of their moral and spiritual being while endeavoring to meet their physical needs. This is true social treatment of disease. I do not wish to be understood as taking the position that nurses cannot or should not administer this social treatment, but the majority of them do not. They lack training for it in the first place, time in the second.

On the other hand, some of the best social work I have seen is being done by women who have had a nurse's training, but I should prefer to call them social workers rather than nurses. I know one who receives in her office between 500 and 600 visits a month from clinic patients who do not wait for her to call upon them but who come to her for light in dark places. These social consultations in the nurse's office are as important as the medical consultations in the clinic. She has also organized two women's clubs,—one for Germans and one for Italians,—a boys' club, a girls' club, and a sewing club, thus securing steady clinic attendance and sustained effort from patients otherwise very difficult to keep under control.

Another nurse, whose energies are chiefly concentrated on social work with her patients, came into my office recently, announcing that she had

just undergone the supreme test of her ability as a purchasing agent or adviser. An "arrested" case, a man with whom the clinic had been in touch a couple of years or more, a driver by occupation, refused to buy a second-hand cab until she had looked it over and pronounced it satisfactory. Is there any doubt about the ability of the clinic to control that particular patient or his family?

WOMEN'S AUXILIARIES

A potent factor in extending the clinic's usefulness along social lines has been the women's auxiliaries. Their value in breaking new paths cannot be too strongly emphasized. Probably the two most striking developments of clinic work in New York during the past year have been made possible through their initiative—one, the opening of Bellevue Settlement House in connection with Bellevue clinic, designed for the temporary lodging at night of women and children while awaiting admission to sanatoria. It is also serving as the headquarters for social work carried on by the clinic, special classes in hygiene and domestic economy having been organized among the clinic patients which hold their meetings at the Settlement House.

The other new departure has been made by the Woman's Auxiliary of the Department of Health clinics, which has taken over and financed a day nursery in order that it may have some place to send the children in the clinic families who have heretofore been discriminated against by the ordinary day nurseries because of their possible tuberculous infection. These auxiliaries have also shared with other relief organizations the burden of caring for needy clinic patients; they have supplemented inadequate salaries of clinic physicians and nurses and in various ways have made it possible for the clinics to develop certain activities which could not have been undertaken without this financial backing of the auxiliaries.

SPECIAL TRAINING OF MUNICIPAL NURSES

The New York Department of Health is about to inaugurate an experiment which will undoubtedly materially strengthen its work along social lines. Some two years ago the Association of Tuberculosis Clinics, eager to strengthen the weak places in the clinics' work, suggested to the Department

of Health a scheme of lectures for its nurses, urging that the resulting increased efficiency would amply repay the outlay of time and money involved. Beginning June 7th, the Department will give its nurses special training for the work they have in hand through a course of weekly lectures on Department routine, the etiology and pathology of tuberculosis, the actual nursing and medical supervision of patients in their homes, the social aspect of other municipal activities, and the principles and practice of social work in order that they may have a sympathetic understanding of methods of social workers and a comprehensive knowledge of existing social agencies and how to use them. Department of Health officials, the Department of Nursing and Health at Teachers' College, and the School of Philanthropy of the Charity Organization Society will provide lecturers from their teaching staff to develop these several courses. Time for attending the course will be given by the Department from the working hours of the nurses, and in addition there will be a system of section classes and quizzes to drive home the full significance of these lectures.

If the necessary appropriation can be secured, the Department is also planning to employ a certain number of trained social workers for the work of the women's auxiliaries. Social service committees, including the physicians in charge, the clinic nurses, and representatives of the women's auxiliaries and the different philanthropic societies have already been organized in connection with the various Department of Health clinics, so that those patients needing social care will have the benefit of expert treatment based upon a complete knowledge of their needs and of available resources to meet them.

CO-OPERATION ENHANCES FOLLOW-UP WORK

These practical plans of the Department to improve its work along social lines mark a long step forward. The social agencies are going to be the gainers thereby as well as the clinics. Expert medical advice in the treatment of many of their cases is just as essential as expert social advice is necessary to the successful handling of the clinic case. The educational work of the clinic will not be concerned alone with the patient and his family. It will be extended to every social agency within reach. The clinic should be a bureau of information on all tuberculosis activities and it should be the gateway through which they are reached. Efficiently serving its district

in this manner, the meshes of its dragnet will tighten up and fewer cases will escape its notice and influence. It will gradually come to know its district thoroughly, and the following up of its cases will be made easier and at the same time more effective. Its responsibility will not end when it has procured suitable institutional care for its cases, but the families of these cases will be kept under observation in order that the earliest symptoms of infection may be detected in those who have been exposed. The education of the family will thus be continued and the living conditions improved, so that the patient when discharged from the sanatorium may return to a far more favorable environment than he left. The clinic's relations with other tuberculosis institutions should be so close and friendly that information should always be obtainable and available for the patient's families. When the patient returns "arrested" or "apparently cured," the clinic will still keep in touch with him and help him to keep well just as formerly it helped him to get well.

On the other hand, if a patient becomes too ill to attend clinic, and institutional care cannot be secured for him, the clinic should still hold itself responsible for his care. In comparison with the sum total of the cases dealt with by the clinics, the number of these bed cases will be few—fewer still when we have adequate hospital facilities. In New York we estimate that approximately not more than 2 per cent. of the total number of registered cases, excluding the "not found" cases, are in need of actual nursing care. Whatever the number may be, it is plainly the responsibility of the clinic to nurse these cases and to furnish a physician to visit them. The organization of the clinic's staff should be such that these extra demands upon its time will not disarrange the regular routine work.

CHILDREN'S CLINICS

Another phase of clinic work, the possibilities of which we are only beginning to realize, is the special class for children. In no one direction does the preventive side of clinic work promise more telling results than among the children of tuberculous families. There are many reasons why every effort should be made to treat these children apart from the adult clinic. Many of them are borderland cases, whose claims for individual attention are dwarfed when compared with the greater need of the more obvious cases in the adult clinic. The diagnosis of these children is exceedingly difficult

and requires special aptitude and considerable experience on the part of the examiner. Even when the child is not definitely diagnosed as tuberculous it should still be kept under supervision to prevent its developing into a case because of its low physical resistance and its exposure to infection. Other medical treatment may be necessary, tonsils and adenoids may need removal, defects in eyesight need correction, dental work need to be done. Frequently when the parents are advised they fail to realize the necessity for such treatment or do not know how to obtain it. With a nurse especially assigned to the work of the children's clinic these things are not only advised, but she sees to it that the advice is carried out. It is generally recognized by medical men that a large percentage, some say the great majority, of cases of tuberculosis occurring among adults can be traced to infection during childhood. It is also an accepted fact that these cases of tuberculosis among children respond most successfully to early treatment. By examining and treating these children we are striking at the very tap-root of tuberculosis.

CLINIC RECORDS

A final consideration of clinic methods has to do with the matter of records. There are good nurses and good physicians who feel that records are futile things at best and that the time spent in keeping them is so much time wasted, not to mention an unnecessary burden upon people already working to the limit. It is perfectly true that what we do for John Smith, the time we spend in examining him, advising him, treating him, and visiting him, is going to mean much more to him at first than what we write down on his individual record or report about him to some gatherer of statistical information. The point is that as we go on treating John Smith, what we have done for him and the results thereof are going to determine in a large measure what we will continue to do for him in the future. The records of many John Smiths studied in the aggregate furnish an excellent measuring-rod for determining the efficiency or inefficiency of a clinic's work. Valuable ideas for new lines of development suggest themselves from a study of this massed information, which at the same time furnishes the argument for putting these ideas into practice. The pettiest storekeeper keeps an accounting of his income and expenditure. He is dealing only with material commodities and the dollars and cents they represent. Because we are dealing with other and higher commodities we have scorned business methods.

Why should we if we are looking for results? Our expenditure is not alone in dollars and cents for salaries and relief, it is in professional skill and experience and spiritual qualities of understanding and sympathy and self-sacrifice. Our income is the protected families, the improved living conditions, the restored health, and the economic independence of those who come to us for help. Is it not worth while for us to balance our accounts occasionally and see if our income is keeping pace with our expenditure, and if not, why not?

CLINICS AS DISTRIBUTING CENTERS

These ideals of efficiency hold equally for the single clinic in a small town or for one of a chain of clinics in a large city. When all is said and done, however, less than half of the patients coming to the clinic will be available for any extended course of treatment. In New York we have found that 59½ per cent. of our cases cease attendance under one month. This fact emphasizes still more clearly that most important function of the clinics, namely, to serve as distributing centers by means of which patients are selected for institutional treatment suitable to their needs. The fact that a clinic holds half its cases less than a month does not imply that it has failed to serve or control those cases. The patients discharged as "non-tuberculous" would be included among these as well as the patients for whom institutional treatment is secured. Others, again, may find it impracticable to continue regular clinic attendance because of the nature and hours of employment. If necessary, a clinic should make special provision to keep in touch with these and to hold up their hands in the effort they are making to work and keep themselves fit at the same time. Night classes for those working during the day-time, a mother's club for the women busy with the care of home and children, a club for working girls, are all of them effective means of keeping hold of the patient who is working. It is a monotonous task to be taking care of one's self day in and day out, month by month, to work half the time and be sick the other half, the amusements of other days put aside because of the necessity of saving one's energies and resting all the time one isn't working. If we can stimulate the working man and woman to keep on the job of taking care of themselves by providing special opportunities for them to continue under our care and observation, we shall have given them another crutch to lean on.

CLINICS IN SMALL TOWNS

Before proceeding to a consideration of the organization of several clinics in any one city, it may not be amiss to discuss for a moment the necessity of establishing clinics in small communities and of increasing the number of clinics already in operation in the larger ones. Many small towns, while recognizing the necessity for providing institutional care for their tuberculosis cases and of visiting and supervising the cases living at home, have as yet failed to acknowledge the necessity for the establishment of a dispensary. In such places it frequently happens that several physicians more or less interested in tuberculosis work offer to examine, without compensation, at their offices any case who may be referred to them, their main objection to the establishment of a dispensary being that it is unnecessary in the first place, and, in the second place, they haven't time to devote to it. In practice the plan does not work. The physician may be out or he may be too busy with other cases when the patient first calls, so that frequently he has to repeat his call several times before he is examined. When he is examined the visiting nurse must call upon the physician in order that she may have an intelligent idea of the doctor's findings. No record is kept of the result of the examination and no subsequent treatment is carried out unless the patient becomes seriously ill.

COST OF EQUIPMENT

In larger cities a few tuberculosis dispensaries are called upon to cover large areas densely populated. They may be treating the maximum number of patients, but the individual patient is receiving but a minimum amount of attention. Undoubtedly the cost of establishing a dispensary is a deterrent factor in many instances.

For the information of those who may be interested in securing the establishment of a tuberculosis dispensary in their own community the following figures regarding the cost of equipping an eight-room clinic housed in a converted private residence may prove helpful.* The total cost of furnishing was $1018.50, distributed as follows:

* Floor plans of clinics, showing a separate building built especially for clinic purposes and devoted exclusively to use of tuberculosis patients, are also appended.

REGISTRATION ROOM		
1 Nurse's Desk	$22 00	
1 History Cabinet (3000 records)	65 00	
1 Card Index Cabinet	8 00	
1 Arm-chair	6 00	
1 Stool	4 00	
4 History Boxes	12 00	
1 Small Glass Table	12 00	
		$129 00
WAITING ROOM		
6 Benches	$100 00	
1 Four-language Sign	18 00	
		118 00
TWO CLINIC ROOMS		
2 Doctors' Tables	$30 00	
2 Nurses' Tables	44 00	
2 Examining Tables	30 00	
2 Screens and Covers	20 00	
4 Chairs	24 00	
8 Stools	32 00	
2 Scales	25 00	
Instruments	20 00	
		225 00
TWO DRESSING-ROOMS		
4 Clothes-trees	$12 00	
2 Benches	33 50	
		45 50
THROAT ROOM		
1 Instrument Cabinet	$60 00	
1 Special Table	42 00	
1 Nurse's Table	22 00	
1 Arm-chair	6 00	
1 Special Chair	18 00	
1 Special Stool	9 00	
1 Immersing Bowl and Stand	12 00	
1 Coakley Light	15 00	
1 Sterilizer	12 00	
Instruments	150 00	
Compressed-air Outfit	60 00	
		406 00
DRUG ROOM		
1 Drug Cabinet	$52 00	
1 Nurse's Table	22 00	
1 Arm-chair	6 00	
		80 00
For the Outside of Building at the Entrance		
1 Brass Sign	$15 00	15 00
		$1018 50

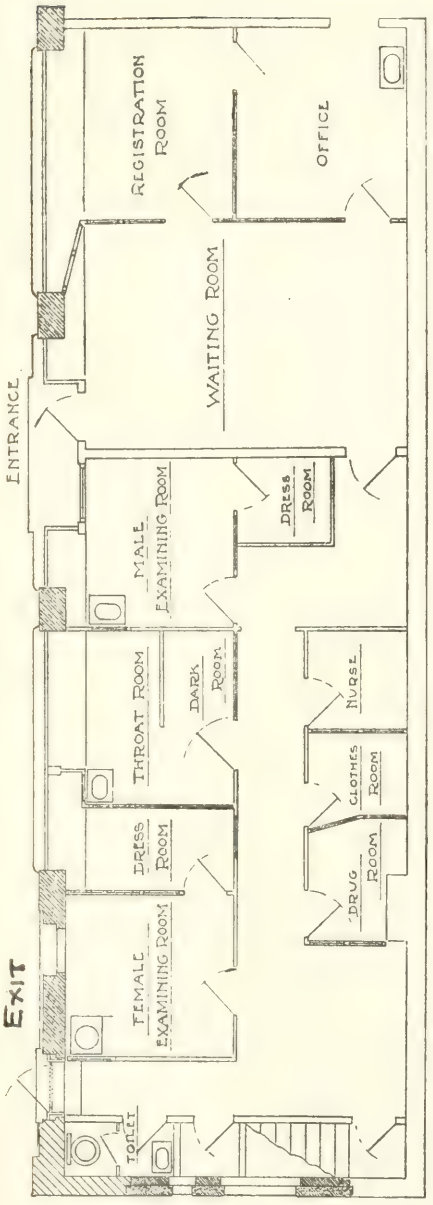


FIG. 1.—FLOOR PLAN OF A HEALTH DEPARTMENT TUBERCULOSIS CLINIC.

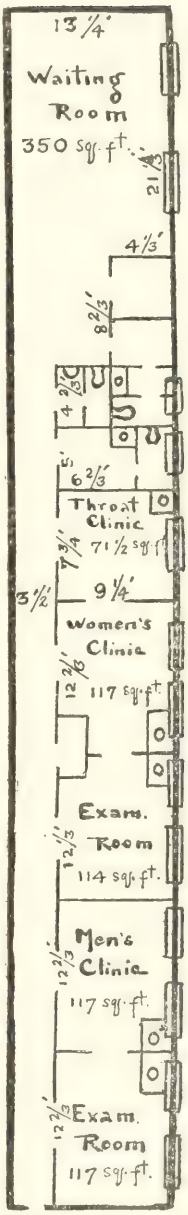


FIG. 2.—FLOOR PLAN OF GERMAN HOSPITAL TUBERCULOSIS CLINIC.

SALARIES OF PHYSICIANS AND NURSES

The amount required for salaries will depend naturally on the size of the staff necessary and whether the medical service is volunteer or paid. There should be no question about the policy of having a salaried medical staff when possible. With no intention of discounting the value of volunteer work, it is nevertheless true that under the present system of volunteer service it is difficult to keep men of the required high standard of efficiency at this kind of work. The offering of a small salary would certainly aid in supplying the demand for physicians to man these clinics. Again, there is undoubtedly an element of danger connected with the constant examination of these tuberculosis cases—an additional reason why some compensation should be made. It should also insure a more regular and prompt attendance on the part of the physician, with the resulting convenience to the patients, who will soon refuse to continue visiting a clinic where hours and days are so uncertain that they are obliged to wait indefinitely and even come two or three consecutive days before they finally succeed in seeing the physician in charge. I have seen a clinic's attendance dwindle down to almost nothing, patients refusing point blank to attend in spite of the most persistent and insistent urging of the nurse, because "the doctor was never there." The salary need not be a large one—an average of $600 a year for six to eight hours' work weekly is what we are paying in New York. The mere fact that there is a financial consideration involved will serve unconsciously to influence the physician to a more regular attendance or to provide a substitute when he himself cannot attend.

The number of physicians will depend naturally on the clinic attendance and the size of the district. The same holds true of the number of nurses employed, whose salary will average from $900 to $1200 per annum, according to the nature of her duties, whether routine or supervisory. A minimum estimate should provide for a sufficient number of physicians in attendance to allow at least fifteen minutes for the examination of every new case, exclusive of the time given to history taking, and at least six minutes to the examination of every old case. There should be at least one nurse for every one hundred patients on the clinic register, including those who attend but once and who are discharged as "non-tuberculous" and therefore are not followed up as well as those who are discharged to hospitals or sanatoria.

COST OF DRUGS

It is difficult to estimate fairly the cost of drugs, yet this is the first item of expense that strikes terror to the private institution when the feasibility of its opening a special tuberculosis clinic is broached. The Department of Health quotes $400 per annum for drugs for a clinic averaging an approximate attendance of 5000. This undoubtedly represents the lowest possible figure, one that can rarely be duplicated except in a few instances. The New York Department of Health buys drugs in the raw, sufficient for its entire chain of hospitals and clinics, and prepares its prescriptions, mixtures, etc., in its own laboratories. Also, it does not dispense the more expensive preparations, such as olive oil, cod-liver oil, maltine, etc.

It may be of interest to compare these figures with those obtained from a dispensary in Schenectady, N. Y. For a year's total clinic attendance of 285 patients, 222 prescriptions were filled by a local druggist at a cost of $150.

Estimates for rent and fuel have not been included, so wide would be the variation in different localities.

CONTROL—PRIVATE OR MUNICIPAL

Thus far we have been considering a clinic maintained as a separate institution with ideal facilities for handling the twenty or more patients who visit it each afternoon, and where, with a slight increase in the staff, enabling morning sessions to be held also, twice the number could be cared for.

Excluding the salary list, the cost of equipment and maintenance may be materially reduced by having the clinic connected with a hospital already maintaining an established out-patient department. A special report, entitled "A Standard Tuberculosis Clinic," recently issued by the Association of Tuberculosis Clinics, embodies recommendations which definitely set a minimum standard for clinic facilities and practical methods of administration. These recommendations are based upon an exhaustive, critical study of the methods and results of clinic work in New York.

The suggestions concerning administrative methods should prove equally helpful to the separate municipally controlled clinic or to the one supported and run in connection with a private institution. The recommendations regarding space, equipment, and staff represent the minimum standard and apply particularly to the private institution, where financial limitations must

be carefully considered, and where the machinery already exists for running the general dispensary of which the tuberculosis clinic is only one department.

Opinions as to the relative merits of clinics run by the city or by an institution differ widely. There is something to be said on both sides. Greater uniformity of method, perfection of the details of routine management, more adequate facilities, and a paid medical staff will be possible under municipal control.

A paid medical staff will insure the existence of a certain discipline, which will make possible the effective carrying out of desirable innovations in the existing system which hospital boards of managers or trustees may be quite unwilling to sanction because of prejudice or conservatism resulting from a long adherence to frequently worn-out administrative methods.

On the other hand, the private institution is much more likely to develop the human side of its relationship with those it serves, to feel that its mission is one of service rather than regard itself primarily as an instrument of control. Naturally, if it is doing effective work, the fulfillment of this latter function will follow as a logical sequence. Imagination and initiative, necessary to the development of new phases of the work, are fostered by this spirit of service, whereas the very effectiveness of the routine and system which secures uniformity in public institutions inhibits this breaking away from current methods of work.

In New York we had to take things as we found them, hence our system of mixed control—some clinics under Department of Health control, others under institutional control. On the whole it has worked admirably. Centralized control, absolute uniformity, frequently level down to a minimum standard rather than encourage the attainment of a maximum standard. Friendly rivalry and healthy competition have stimulated the development of new activities and have resulted in a constantly mounting standard of efficiency. The institutional clinics have kept the milk of human kindness circulating and have blazed new trails. The municipal clinics have shown us how to perfect the details of administration, each making its contribution to the sum total of good accomplished. The work of all has been strengthened and solidified and made increasingly effective through the co-ordination of effort made possible by their organization into the Association of Tuberculosis Clinics.

SPECIAL TUBERCULOSIS CLINICS IN NEW YORK

It may be of interest to trace briefly the history of tuberculosis clinic work in New York. While the country-wide tuberculosis movement has been marked by an astonishingly rapid growth and development, we in New York feel that our co-operative system of dispensary work has marched forward at an even more rapid pace.

Eighteen years ago the first special tuberculosis clinic in New York was organized; the following year a second one came into existence, and seven years later a third was undertaken. All three were connected with private institutions. Within the next three years the city established four more such clinics: three in connection with city hospitals, one under the immediate control of the Department of Health. Patients attended these clinics from all over the city; milk and eggs were dispensed on request, and nurses visited the patients' homes. Sometimes a nurse would travel from end to end of the city and back again to visit a patient who lived within a stone's throw of another tuberculosis clinic of which he knew nothing. Sometimes, again, the patient did know about the neighboring clinic and the one at the other end of town as well, and asked and received bounty from each. Milk was a welcome addition to the family dietary and superfluous eggs could always be sold to more prosperous neighbors. The margin of profit was large when the original cost was either nothing or occasional carfare at most. In short, it was the old story of overlapping and duplication of work, of unnecessary expenditure of energy and time, of resulting demoralization to the recipients of indiscriminate charity. We had a clinic service for the special treatment of tuberculosis. We most certainly did not have a system of adequate clinic control.

Six years ago the Charity Organization Society was made the almoner for a special fund given for the relief of the tuberculous poor. The committee appointed to administer the fund was made up of physicians in charge of these special tuberculosis clinics and of representatives of the charitable society in question. At the end of twenty months the fund was exhausted and the work of the committee as a committee was at an end. Individuals had been helped to renewed health and strength; families had been protected from the dangers of infection.

The by-products of the committee's work were even more valuable. An old ferry-boat was fitted up as a day camp in order to try out the possibilities of home treatment for patients who for one reason or another were

unable to leave the city. In other words, the sanatorium was brought to the patient instead of sending the patient away to the sanatorium. The value of the experiment was recognized, the day camp became permanently subsidized by the city, and eventually three other similar day camps were established and are being supported by city appropriations. Two private institutions are also maintaining day camps in connection with their tuberculosis clinics. At four of these day camps the Department of Education is providing teachers for the children with tuberculosis who have been excluded from the public school. Another by-product was the demonstration of the evils resulting from the lack of co-operation between existing agencies, notably the tuberculosis clinics. The crystallization of this particular by-product produced an organization formed expressly to co-ordinate the work of these clinics.

THE ASSOCIATION OF TUBERCULOSIS CLINICS

The Association of Tuberculosis Clinics was organized in January, 1908. Nine clinics made up its original membership; municipal and private institutions meeting on equal footing, acknowledging equal responsibilities, and presenting a unique example of co-operation. Each institution entering the Association agreed to conform to three cardinal principles: to segregate and treat its tuberculosis cases in a special class or clinic; to maintain supervision over the homes of these cases through a visiting nurse working in and from the clinic; and to confine its work to cases living within a certain district, all other cases applying for treatment to be transferred to the clinic of the district within which they lived.

Theoretical objections urged, when the formation of the Association was first projected, disappeared in the face of actual experience. Some institutions, thinking that the importance of their work depended on volume, feared that any limitation of their field of activity would cut down the amount of clinic material. They were reassured when the transfer system at the same time that it took away cases brought in others from other clinics, thus balancing the losses by the gains. Teaching institutions realized that they still retained sufficient material for the training of their students in physical diagnosis, as the cases were examined before being transferred.

The problem of meeting the city's need, which seemed hopeless merely from its size, became soluble when broken up into a number of minor problems having to do with a circumscribed area. The most valuable asset of

all was undoubtedly the spirit of close co-operation that was engendered. Conservative, aristocratic institutions came to appreciate that municipal departments also had ideals and tried to realize them. City officials recognized that failure to conform to set rules promulgated by them as a part of the law and the gospel was not always due to unwillingness or to incompetence, but was frequently the result of insufficient financial support. A better understanding of mutual dependence was brought about and a more tolerant appreciation of each other's point of view. The Department of Health recognized the non-department clinics as their stanchest allies in the work of the sanitary control of their particular districts. On the other hand, in several instances poor institutions, crippled by insufficient funds, were glad to have their staff supplemented by the addition of Department physicians and nurses.

Monthly meetings throughout eight months of the year brought the members of the Association together for full, frank discussion of every phase of the work. Just as the clinics serve as clearing-houses for the tuberculous public, so has the executive office of the Association served as a clearing-house for the clinics. Monthly reports of their work have been received, summarized, and interpreted, and the results submitted for discussion to the membership of the Association. Bulletins of information regarding rulings of the Board of Directors, new procedures adopted by the Department, and any item of general interest are systematically sent out to the chiefs of clinics and the supervising nurses.

While the Association has always considered it entirely out of its province to interfere in any way with the internal management of the individual clinics, it has nevertheless given valuable assistance to new clinics in organizing their work along lines which have proved successful in the older clinics. Whenever difficulties have arisen the Association has acted as intermediary and in every case has been able to readjust things readily.

THE DISTRICT SYSTEM

It is the district system which has proved the keystone of the work of the Association as a whole. The boundaries of a clinic district are agreed upon when the clinic is admitted to membership. As the clinic treats only cases from its own district, transferring to the proper clinic applicants for treatment who live in other districts, the nurse's visits are likewise limited. Her energies are thus concentrated on the supervision of patients living within

the immediate neighborhood of the clinic. Cases are effectively followed up with no useless expenditure of time and effort, and the old evils of duplication and overlapping are entirely done away with.

All transferred cases are informed as to the reason why they are refused treatment at the first clinic, and a card is given them containing explicit directions regarding the name, location, and hours and days open of the clinic to which they are being transferred. In addition, Department of Health nurses, in the capacity of inspectors, visit these transferred cases and make sure that they do report at the second clinic. The conserving of the time and strength of both patient and nurse has not been the only good resulting from this transfer system. A much closer bond has been established between these various clinics, and a "team" spirit has been developed among the physicians and nurses that cannot fail to strengthen the ideals and aims with which they are inspired.

GROWTH OF THE ASSOCIATION

From the first, the policy of the Association has been to encourage the formation of new clinics, each with its own particular district, thus insuring more and more intensive work as time goes on. Within three years the number of clinics belonging to the Association increased from nine to twenty-two. The first year was naturally a year of experiments, of adjustments and of re-adjustments. The second year the Association made a critical study of the clinics composing its membership, with a view to taking stock of their equipment, material and human. Suggestions were offered and accepted, better methods followed in the wake of improved facilities, each contributing to and making possible the handling of an enormously increased output.

The next step forward was to find out if the quality of the output was measuring up to the ideals for which the Association is supposed to stand, and so during the past year its main efforts have been concentrated on studying the results of clinic work as evidenced in reports made by the clinics and others regarding the patients, and as evidenced by the patients themselves when considered with regard to the frequency of their clinic attendance and their home conditions.

In three years the volume of work handled by the clinics has increased nearly 50 per cent. In 1911, 32,058 cases were reported in special tuber-

culosis clinics as against 21,811 in 1909; 63,030 nurses' visits* were made during the past year—21,160 more than in 1909. Two facts are worthy of note in connection with this very evident extension of the clinic's field of usefulness, both of which go to show that the educational propaganda we have been carrying forward is beginning to bear fruit. The clinics are getting hold of the children in families where there is tuberculosis. Last year showed an increase of nearly 300 per cent. in the number of children treated in the clinics over those treated two years ago.

The second noteworthy fact is that of the total number of cases passing through the clinics in 1911, 7390 were discharged as "non-tuberculous," 176 per cent. more than the number discharged as "non-tuberculous" in 1909. This certainly indicates that the gospel of prevention is sinking into the lay mind, and that the old fear of tuberculosis which caused many a one wilfully to shut his eyes to the possibility of his infection is dying out. Because of this willingness to seek medical advice when suspicious symptoms are first noticed many an early stage case is recognized, treated, and cured. In the old days such cases would ultimately have terminated fatally, failing this early recognition and treatment.

Effective control and ultimate eradication of tuberculosis depend mainly upon two conditions, medically speaking: the segregation of advanced cases and the early recognition and treatment of incipient ones. In the special tuberculosis clinics we have a machinery capable of realizing this latter condition and developing it to the limit of its possibilities. Co-operation has been secured, administrative problems solved, and the public educated to the use of the clinics. The machinery has been thoroughly oiled and is in good running order. There remains now the perfecting of its parts so that the quality of work turned out may be raised to the highest possible standard.

The ideal for which the Association has stood since its inception has been for more intensive work, districts growing ever smaller and smaller, so that ultimately every house and every family which harbors a case of tuberculosis shall be known to the physicians and nurses of the clinic of the district. With the establishment of additional clinics and with better equipment of existing clinics we shall see this ideal accomplished. We shall have more doctors and more nurses treating and visiting fewer patients, the clinics thus

*No comparison between the number of cases reported and the number of nurses, visits is possible for the purpose of estimating the average number of visits per patient' as the total number of patients reported includes those transferred to other clinics as well as those discharged as non-tuberculous. The number of visits to a positive case is determined by the patient's need and the duration of his clinic attendance.

enabled to fix as their standard the maximum of attention to a few patients rather than the minimum of attention to a large number.

No stronger testimonial to the value of the Association could be given than the recent request of the Department of Health for the admission to membership of the Department tuberculosis clinics in Brooklyn and Queens in order that the work of these clinics may receive the stimulation that is bound to follow if the men doing this work are part and parcel of an organization of the strength and importance of the Association of Tuberculosis Clinics.

CONCLUSIONS

In conclusion, the main elements, indispensable to any adequate clinic control of tuberculosis, are—1. A clear recognition of the functions of a clinic. 2. Adequate means of fulfilling these functions. 3. Where there exists two or more clinics in a given locality, efficient co-ordination of their efforts by means of some central organization.

The functions of the tuberculosis clinic have been stated as—

1. To diagnose doubtful cases;
2. To administer medical treatment;
3. To supervise patients in their homes;
4. To serve as a clearing-house for hospitals and sanatoria;
5. To educate patients and their families.

The efficient fulfilment of these functions depends upon—

a. An adequate clinic staff;
b. A thorough knowledge of the district covered by the clinic;
c. An effective follow-up system;
d. Development of the social phase of clinic work;
e. Close co-operation with other tuberculosis agencies;
f. The keeping of accurate records.

A central organization, co-ordinating the work of two or more clinics existing in a given locality, should be based upon a district system whereby the work of each clinic will be limited to a certain territory, and all cases living outside of this district will be transferred to the clinic of the district within which they live.

DISCUSSION ON PAPER BY MISS CROWELL

John R. Shillady, Buffalo: It seems to me that this paper by Miss Crowell illustrates one thing, that it pays to mix brains with social work. The highly developed organization of which she speaks, which, of course, is possible only in the larger centers, illustrates, nevertheless, the importance of using intelligent means to coördinate all the work.

It seems to me that the keynote of adequate clinical control is involved in the antithesis of service rather than control, whereas if I may, for a moment, refer to the question of compulsory removal and detention of patients, that has its weakness in the fact that it is on the side of control, and we are bound, as social workers, first to serve and to control largely through service. Our most important function should be the service to the patient and the protection of the community through that service, rather than that the first emphasis be on control *per se*. Miss Crowell's paper showed what can be accomplished by developing the ideal of service. In a social disease, with the patient a victim, we must not use force as a substitute for intelligent, humane service. Force must at times be used, but only as a last resort.

I am of the opinion that the nurse should go just as far as she can in the adjustment of the social factors wherever there is still a medical question involved, and when the medical question begins to be minimized, she may turn over the social end of the work to one of the various social workers. I believe also that not alone should the trained nurse be socially trained, but that no district worker of a relief society should work without an elementary medical training. The salaries paid on both sides are often so small that I am almost ashamed to ask any of them for any particular training. I think the district visitor should have at least a minimum of medical training, and a nurse more than a minimum of social training.

Another important factor in both service and control is the "doing something" for the patient. I wish, however, to dissent from the "bread-pill" idea. So long as the medical profession continues to treat people along that line they will continue to be stupid. I agree with Dr. Cabot, that it is better to let a few people die, if necessary, but tell them the truth. Telling the truth does not kill as often as the bread-pilling method, which does not educate, but only perpetuates a fetish.

I think we should not accept all charity from our physicians, but should pay them. I believe in the elimination entirely of the unpaid clinic physician wherever work of a continued kind is required. We feel very grateful to those who have given their time to us without pay. In Buffalo we have

eliminated our volunteer staff because it has not been found to be effective. We pay one physician $80 a month and another $50.

Dr. R. H. Bishop, Cleveland: Adequate tuberculosis clinic control means, of course, efficient clinic control, and I am under the impression that clinic control of tuberculosis is absolutely inefficient at the present time.

In our dispensaries in Cleveland we find that 77 per cent. of our cases are advanced cases when they come to us. Twenty-three per cent. are in the early stages of the disease. There are various reasons for this. One is that the average physician does not diagnose the case early. The physician treats the case over a long period of time, and then, when it becomes advanced, he sends it to us to take care of. On the other hand, I am inclined to think that there is a large percentage of these cases that we are failing to reach, even though we are in contact with them at various times through the homes. I believe that clinic control of tuberculosis in any community is bound to be, in course of time, a failure unless it is under the health department, because the control of tuberculosis is a part in an enormous public health campaign. For the last year and a half we have had in Cleveland municipal control of tuberculosis. We have established a bureau of tuberculosis under the department of health, and we have opened free dispensaries in various sections of the city. One of these dispensaries is controlled by the Anti-tuberculosis League. Since we have opened these dispensaries we have increased the number of cases reported to the department of health almost 100 per cent. The number of cases that we have been in touch with through our nurses and through the department, ending the last three months of last year, averaged 75 per cent. Since the first of January it has averaged 89.9 per cent., and there were twenty-one days in May with fifty-eight deaths when we were in touch with every single case. I feel that in any community we must have municipal control—we must have the work under the health department in order to make for efficient, thorough control of the disease.

There is another factor in the dispensary work at the present time which I think must be thoroughly overhauled before we are going to come into proper relationship to this work, and that is an overhauling of the very backbone of the dispensary work, that is, our nursing force. I am convinced, insofar as I can see it in our work in Cleveland, that there is entirely too much specialization in our nursing work. I am beginning to believe that what we need is a nurse who will act in the capacity of a general practitioner instead of a specialist. There are reasons for this: First, on account of economy. You take a community like Cleveland, or in smaller communities where you have a force of forty or fifty or seventy-five nurses. You have twenty-five

tuberculosis nurses, twenty-five babies' dispensary nurses, and ten or twelve district nurses, all of them covering the same territory, and overlapping each other at every turn. You are imposing upon the families. Not only that, but—and this is one of the most serious objections—you get a constant shifting of responsibility on the part of the nurses. The tuberculosis nurse is interested in the one problem that presents itself in the tuberculous case, and any other condition does not particularly concern her. Now, to my mind that is absolutely wrong, and if you stop to analyze the work of any one nurse you will find that up to a certain point the work of each nurse is practically the same, and it is absurd, I think, to think for one single minute that we cannot bring our nurses up to the standard where they can take care of every condition that arises in these homes that militates against the health of the family. And I think until such time when we have smaller districts with a nurse in charge of each district and responsible for the health of that home we are going to be working at cross purposes and not doing efficient work.

Dr. V. C. Vaughan, Jr., Detroit: There are one or two practical points I desire to call attention to: First, we should not speak about adequate clinic control, since clinic control cannot be adequate without hospital control also. The two are necessarily joined hand in hand. It is impossible to control patients through a clinic alone, no matter how hard we may try. The individuals may come to the clinic, where they are given certain instructions, but there are a hundred and one things that a tuberculous patient does every day that he should not do, and he can be taught these only in a proper institution.

We have established, in connection with the Board of Health Clinic in Detroit, a hospital or training-school for consumptives. Every individual who is diagnosed as tuberculous is sent to this hospital training-school for a short time. Here they are taught certain precautions which they should employ, and we see that these precautions are carried out after the patient leaves the institution. We have never found that our patients gave us false addresses. We have laws which we can enforce if necessary with regard to the disposal of sputum, but we have never found it necessary. The hospital is an institution in which all stages of the disease are cared for. We have no trouble in getting advanced cases to come, and the reason for this is that it has not the reputation of a death-house, because people occasionally come out of there alive. We have the largest death-rate of any hospital in the city of Detroit and a constant large waiting list of patients. Of course,

the cases are separated. The early cases are in the cottages, where they do not come in contact with the advanced cases.

Miss Flora M. Glenn, Chicago: I wish to say a few words in regard to Miss Crowell's most excellent paper. First, as to medical treatment: We have found this most necessary, and feel sure that there is still efficacy in drugs, and that the careful consideration received by our patients at the hands of the doctors in charge of our clinics is a most important part of their treatment. Second, as to nurses as social workers: No one doubts the desirability of a course of training in social work; however, this is not often a possible plan for nurses. In Chicago the tuberculosis nurses feel that they are not essentially social workers, but they have enough of the social sense to coöperate with those organizations which are particularly trained in this line. We have our nurses attend the committee meetings of the Charity Organization Society and feel that they are being developed in the right way. Third, as regards records: This is another line in which we feel that we are educating our nurses, and most of them feel quite strongly the great necessity for careful work on the records, which we are now trying to make as perfect as clinical records.

Dr. Woods Hutchinson, New York: I think every one will agree with Mr. Mann that this is one of the most important problems coming before us—dispensary and hospital control. I want to emphasize what Dr. Vaughan said, that without adequate hospital accommodations dispensary control is always going to fall short. And as the situation at present stands, we have in New York barely bed accommodations for about 10 per cent. of our tuberculous patients, and no dispensary management or organization on earth, no matter how perfectly run, can make headway against the disease with that limitation. Our death-rate in New York has remained at about 9000 per annum for the last seven years. We have been marking time.

The second point that I want to suggest is that while I have the greatest confidence in and admiration for the dispensary and the excellent work it is doing, I think we are in danger of too much confidence in it as a final means against tuberculosis. In the first place, as has been shown in the excellent paper of Miss Crowell, there are 60,000 visits paid by nurses to 25,000 patients—that is, about two visits a year to each case. There were also 59 per cent. of the patients who disappeared from control after a month. I would like to ask Miss Crowell about what percentage of patients who go into the dispensary really so conduct themselves as to be no source of danger to their families?

Miss Crowell: Not a very large one, but I think that is due to the fact

that in New York we are dealing with a vast foreign population. We have other things to consider besides their physical condition. They are very hard to handle and very hard to educate.

Dr. Hutchinson: I think that is perfectly true, and the same result was found in Baltimore. I believe about 3 per cent. of the patients under dispensary control there were recorded as thoroughly careful and as taking full precautions. I had a similar experience in Edinburgh. Under Dr. Phillips they have a very well-worked-out and admirable system of dispensary control. I am sorry to say that the dispensary system is being played against the sanatorium and hospital, because it is so much cheaper. In England this summer, when there was a proposal to appropriate a million pounds for sanatoria, the dispensary people, headed by Dr. Phillips, brought in an objection on the ground that they could control the situation very much more cheaply by the dispensary. I asked the physician in Dr. Phillips' dispensary what percentage of his cases actually conducted themselves as they were told to in their own homes. He said he thought 75 or 80 per cent. I said: "Will you ask the next five successive patients the question, 'Do you sleep in a room and bed by yourself?'" It happened to be the women's afternoon. Four of the five were sleeping in the same room and two in the same bed with other people. That is a sample of the way in which the dispensary patients are obeying this control.

I believe that our dispensaries and our sanatoria are both only half-way stations—that our sanatoria from this day on ought to open their doors to every case of tuberculosis that comes, take them in, and do the best they can for them, and the longer they keep them under control, the more good they are going to do the community, instead of dealing only with selected cases. They select their cases so carefully in some of the sanatoria that it is about as hard to get in there as it is to get to Heaven. Indeed, many of their applicants do get to Heaven first.

Miss Ellen N. La Motte, Baltimore: We have tuberculosis dispensaries in Baltimore, but all the nursing is done by the Health Department nurses. We have a nursing staff of sixteen. There are five dispensaries in the city, two of which are under the Health Department. These are chiefly valuable, however, as diagnosing agencies. We believe the main function of the dispensary is to diagnose cases which cannot be diagnosed anywhere else.

What happens as far as these cases are concerned? To study results, we have divided them into classes: patients who have been visited for three months; those who have been visited for six months; those who have been

visited for one year; those who have been visited for two years. Now, you would think that the patient who has been visited for two years would be far more careful than the patient who has been visited for only three months. But as a matter of fact the results are practically the same. In all four classes we find that we get about 50 per cent. who are fairly careful. The percentage of fairly careful patients is no higher at the end of two years than at the end of three months. We exclude from our classification such a thing as a *careful* patient at large in the community. We cannot get anywhere until we have hospitals for our advanced cases. Sanatoria are all right, but they do not deal very deeply with the problem.

AN ADEQUATE EDUCATIONAL CAMPAIGN

By Hoyt E. Dearholt, M.D.
Milwaukee

When the dictum was propounded that the tuberculosis problem was a problem of education, the sponsor did not restrict, to any appreciable extent, the activities of agencies formed to combat it.

In a broad sense the term "education" offers sufficient latitude to embrace the acquiring or imparting of any knowledge. Conceived thus, there is no limit to the breadth of the subject that has been assigned me. In point of fact, it was unquestionably intended to limit my discussion to what might more properly be termed "advertising," except that the term has acquired a rather unsavory application which makes one hesitate to use it without qualification. However, defined,—"to inform, certify, warn, admonish,"—nothing could express better the object and intent of the so-called educational campaign as undertaken or carried out by tuberculosis organizations.

The term "education" likewise creates conflicting conceptions which are reflected in the educational work of schools and colleges no less than in the work of anti-tuberculosis organizations, and, therefore, also needs qualification. We find fundamentally opposed views tenaciously held in the great educational institutions as to what education is and as to what is its purpose. There is the class that holds that culture should be the aim of the student. This group, through the snobbishness which is in all of us, rather looks down upon the other group which, with no less veneration, believes that knowledge is more glorious in active, productive labor than it is enshrined in the brain-cells and libraries of the elect.

Inasmuch as I hold the function of the volunteer anti-tuberculosis organization to be unqualifiedly utilitarian, it is intended that wherever the words *education* or *educational* are used in this discussion, *advertisement* or *advertising* might be substituted.

Personally, I like the term "advertising." No one suspects the design to be other than to secure the greatest attainable and tangible results with

a minimum of cost and delay. Whatever other abuses may have been committed in its name, pedantry has no place there. The word is agreeable to me, further, for the very reason that it is offensive to so many. It suggests commerce and industry, with their incident competition and ambition, exacting but broad-gage economy and profitable productiveness—titles which ring truer and are more rugged than "love of humanity," "unselfishness," "self-sacrifice," and many of the other words and phrases which are commoner, in social work, than the qualities they are supposed to label.

It will be seen from the foregoing that my ideal of an adequate educational campaign more nearly finds its expression in the world of practical business than it does in academic circles. My conception, therefore, of an educational campaign for a tuberculosis organization will be found to reflect impressions drawn from a study of the technic and principles which underlie the drawing power of successful advertisers.

Our pupils constitute the rank and file of mankind—plain people, to whom the demonstrations and didactic work of a university or even of a high-school laboratory and lecture room would be either incomprehensible or fatally unattractive. Our practical efforts are not simplified by the consideration that ours is an ungraded, heterogeneous student body made up of illiterate, common school, and higher grade pupils and graduates. Not assured that our instruction will fall upon willing ears, we have not the authority of the schoolmaster or of the sanitary police officer to enforce attention. Nevertheless, because apathy and indifference underlie the general problem, the task of reaching the unwilling and uninterested offers the greatest obligation.

To meet the varying conditions, it is necessary to institute a programme so flexible as to be readily adaptable to the needs of any, and comprehensive enough to embrace the demands of all.

Consciously or unconsciously, an adequate educational campaign must fulfil each of the following demands:

1. Arrest attention.
2. Excite curiosity.
3. Create and hold interest.
4. Stimulate desire.
5. Compel action, sacrifice, and competent effort.

One may easily arrest attention, excite curiosity, and create and hold interest by any extraordinary act. The more senseless and irresponsible it is, the more likely it is to succeed in this. To indicate how purposeless the first three or even four factors may be without the final factor one need only

recall the spectacle of a fallen horse upon a crowded street. The most preoccupied of busy men will usually stop sufficiently long to see what the outcome will be. It is safe to say, however, that in the ordinary man no desire to help is created. Even a lover of horses, in whom the incident may stimulate a desire to assist, is likely to need further incentive to compel him to action, to ignore the curious onlookers, and, at the danger of soiling his clothes and with even some chance of physical hurt and a certainty of discomfort, give aid.

I have said above that our object is utilitarian. Unless our efforts bring about actual accomplishment we will have failed utterly in our obligation. Whatever valuation may be put upon the work of professional actors, our function is not primarily to entertain, amuse, or thrill our audiences. These have their place in our programme, but only as they pave the way to securing the means by which tuberculosis may be cured and prevented.

While it may have been expected and intended by the programme committee that I should present some form of definite programme rather than to discuss in a more or less rambling form the principles upon which such a programme should be planned, I, nevertheless, believe the consideration of the principles of programme-making to be of infinitely greater importance than the display of an outline.

It is desirable, for reasons of economy in time, money, and effort, that our educational work be standardized. The failure to do so entails no end of costly and time-consuming invention, experiment, and original production. I can, however, see no possibility of devising a comprehensive programme which could be universally adopted and employed. A programme suited to the needs of a municipality of a million inhabitants will sink by its own weight in a hamlet of a hundred. Even geographical and temperamental considerations must be balanced in devising a working programme. The instructor who does not take into account the offensive and defensive prejudices of his individual students or collective student group, is doomed to well-merited failure, or, what may be even more reprehensible, indifferent success.

What may be well calculated to receive respectful and sympathetic attention in New England might, with equal certainty, excite derision and contempt among the people of the western commonwealths. What may stimulate interest in the middle or far western states is likely to be too hearty, boisterous, or rude for the older and more conservative public taste.

The personal equation, as represented by the director or directors, or by the individual members of the executive staff, enters into programme-mak-

ing. As human nature is constituted, it is easier to nurse the child of one's own conception to lusty, productive manhood than it is that of another's. One who will uncomplainingly sacrifice sleep to minister to the colicky antics of his own cherished offspring will consign a no less difficult child of another to everlasting perdition. By the same token one can bolster, boost, and bully a mighty weak hobby to successful issue. Even within the institution, the individual to whom a task is assigned should be encouraged to feel that the plan is in part at least his own.

A danger which besets every anti-tuberculosis agency is that it may attempt not too much, but too many things. I am convinced that it is easier to awaken imagination, interest, and demand in a big enterprise than it is in a small one. But attempting to shift an entire population so that it can see every side and angle of the tuberculosis problem in all its ramifications is too much to expect of a naturally conservative and intensely practical public opinion. The public very properly demands to be shown—first, that the disease is as prevalent and menacing, as we all hold it to be; second, that the remedies we propose are reasonable, practical, and attainable. Convinced of these, I think there need be no apprehension about the support that will be gladly accorded.

While actual working programmes may not be tractable to standardization, and attempts to elevate or lower them to a common level may be unprofitable, the fundamental principles underlying each ought to be universally acceptable and accepted. To construct an educational campaign, which is a programme in motion, one needs a stable and substantial platform. In Wisconsin we hold the function of a volunteer tuberculosis organization to be to awaken and stimulate the responsible authorities to the need for, and actual provision of, adequate means of controlling the spread and very existence of tuberculosis.

Under no circumstances have we been threatened, cajoled, or flattered into doing relief work. We have steadfastly held to the proposition that tuberculosis is a problem of civilized life; that its responsibility rests upon the machinery of civilized life, to wit: state, county, and municipal government. There have been times when our very existence has been threatened by the public, which had so much difficulty in understanding why we did not give the relief we held to be so sorely needed out of our own funds. Gradually, however, the response and painstaking explanation made to these queries forced the knowledge home. As time went on and definite accomplishments could be demonstrated, the people learned and appreciated the fact that our conception put a time limit upon the drafts that

were to be made upon private philanthropy and that eating the seed is evidence of the shortest sighted husbandry.

In inaugurating our educational work, we found an unwillingness to believe unpleasant truths about home conditions. Our information and warnings would be accepted as being applicable to cities remote from the one in which we were prosecuting our educational efforts, but they could not be true of the beautiful, prosperous, healthful home town.

This skepticism led to our surveying a number of cities, towns, and villages of varying sizes and one rural county. After this was accomplished and we could point to conditions about "our town" or in a neighboring town which the citizens recognized as presenting practically the same general characteristics, our difficulty in attracting attention, curiosity, and interest was removed. The desire for improved conditions followed rapidly enough, and in many quarters the most splendid accomplishments have been brought about through self-sacrifice and competent effort.

The educational agency is forced to suggest and even apply the remedy, as well as to diagnose the evil and warn against the dangers. The County Sanatorium for second and third stage cases appeals to us as being the most effective and potent remedy to prescribe and administer for the protection, relief, and cure of society afflicted with tuberculosis. The dispensary and visiting tuberculosis nurse increase the potency of the main ingredient of our prescription. As rapidly as possible, to be consistent with our fundamental principles, these latter agencies should be incorporated in competent health departments.

Instead of embarrassing the general educational campaign, efficient agitation for specific objects, such as the county sanatorium, the tuberculosis visiting nurse, the dispensary, etc., gives point and direction to the teaching that tuberculosis is curable, communicable, and preventable. The campaign for such definite projects should be so conducted as to insure an appreciation, upon the part of the individuals who comprise the public, of the necessity of all the personal safeguards it is possible for an individual to employ. When this is done, failure to secure the ostensible object is robbed of half the sting of defeat, and, indeed, sufficient will have been accomplished to warrant the outlay in effort, time, and money.

Educational work throughout the nation has hitherto been confined almost exclusively to the larger communities. This has been justified up to this time by considerations of expediency. The fact must not be overlooked, however, that tuberculosis is almost if not quite as much a problem of rural as of more congested community life. When, as in Wisconsin, far

from being an atypical American Commonwealth, it is learned that over one-half of the population is rural, the obligation of continuing our campaign to the isolated residents is imperative.

The work for establishment of county sanatoria in Wisconsin indeed has offered us no alternative but to carry our campaign to the farmer. With the exception of but one or two counties, the representatives of the farming districts are in the majority and control the county government. The problem of constructing an adequate rural educational programme alone is difficult enough to warrant a conference of several days' duration.

Except in technic and details of execution, our educational programme in Wisconsin does not differ materially from that which forms the basis for activities elsewhere throughout the country and with which you are so familiar as to make a recital unendurable. It is not the programme that matters so much as it is the manner in which it is employed.

Our experience seems to justify my saying that better results may be accomplished by a higher degree of specialization than is commonly employed. It is rather too much to expect an individual to lecture, organize, write copy, conduct a seal campaign, etc., etc., with equal facility. If means will permit, each of these divisions offers sufficient opportunity to engage the entire time and best efforts of a competent individual. The staff, however, should be sufficiently versatile to allow shifting and, if necessary or advisable, reasonably satisfactory transposition.

The Red Cross Christmas Seal Campaign offers the best educational opportunity so far devised, inasmuch as it embraces every factor I have held above to be essential to an adequate campaign. Its full possibilities are only realized, however, when it is considered not as being primarily a revenue producing enterprise. My personal esteem for it as an educational campaign is so great that I believe I can honestly state that, if necessary or possible, I should be satisfied to see every dollar raised reinvested in extending or intensifying the popular interest. Better than any other means it appeals to the children, through whom we may hope to influence the parents and voters of this as well as of the succeeding generation.

In prosecuting a popular educational campaign, we must not neglect the opportunity of multiplying our results by educating the educators, influential professions, political and social leaders. Obviously, what will appeal to the taste of a fishwife must be refurbished to be presentable to milady of the drawing-room.

I hope I will be pardoned for introducing a few words of warning against the danger in our zealous educational work of spreading misinformation.

It was probably inevitable, in any case the danger was foreseen, that the public educational crusade against tuberculosis should take with it some fallacies or half-truths which might later react against the success of the movement.

One of the most important of these relates to the curability of the disease. Where apathy was so deep-rooted and pessimism so perverse, it was not strange that the advocates of a new philosophy should, perhaps, have gone further than exact truth in their desire to strike a balance. The campaign of education has succeeded beyond the wildest dreams of the pioneers, and even those who joined the crusade five years ago had no precedent or logical grounds upon which to expect such popular interest and enthusiasm as is manifest throughout the world today.

Honesty forbids too optimistic and enthusiastic claims upon the ease with which tuberculosis may be cured. Indeed, at the risk of encouraging a return to the pessimistic attitude of past ages, it is demanded of us that we do not countenance the setting of alluring traps which will later be found to snuff out not alone hope, but life itself.

While the curability and arrestability of the disease is well-nigh positive in at all suitable cases, the permanence of the cure or arrest seems to be in direct ratio to the sacrifice and effort demanded of the patient. Instead of encouraging the belief of our public that curing tuberculosis is easy, let us, while encouraging sufferers, be as honest as is demanded by stubborn facts.

> Provided a patient and his friends are not deceived by the insidious onset and progression of the disease—that the same energy and devotion are applied to a cure that are necessary for success in any work—tuberculosis is curable.

Another most interesting misconception has been that milk and eggs are almost specific remedies for the disease. The acceptance of this fallacy has become so wide-spread that I have had a number of physicians of average ability, in discussing treatment, put such emphasis upon their prescription of a milk and egg diet as to make me confident that this was their therapeutic sheet-anchor. Instead, of course, we should be teaching that milk and eggs are little more than reasonably cheap, easily assimilable foods. I am not so well assured of even this much in the case of milk, for Dr. Hay, of Stevens Point, has almost convinced me that milk is an exceedingly bulky food, and, when thus considered, is far inferior and no more economical than meat, cheese, and butter.

If there is one consideration more than another I should like to be em-

phatic upon, it is that tuberculosis is primarily transmitted directly from patient to victim. While appreciating to the fullest extent the housing, economic, and other social phases of our problem, I feel that our results in control of the spread of tuberculosis will be in proportion to the degree in which we steadfastly resist the appeal of associated problems.

Before bringing this discussion to an end let me state (if the conclusion is not already obvious) that I am much more concerned with the attitude of the programme-maker than I am with the programme; that if he be animated by a broad conception of the problem and is thoroughly possessed by the determination to secure definite and attainable reform measures, we need not dally over the selection of an itinerary. Failing this purpose, we need not delude ourselves into the notion that there is any possible substitute for interest, ingenuity, originality, and judgment.

The campaigner who enters the lists against tuberculosis, and the ignorance which has fortified this mild disease and made of it a most serious problem of civilization, has great need of a practical working knowledge of every-day psychology. The public, which contributes the financial support that makes the prosecution of his work possible, has an incontrovertible right to demand economical, practical, and efficient administration. Where there is so much need and opportunity for virile accomplishment, a vainglorious or overnice sense of dignity and regard for convention is positively reprehensible.

DISCUSSION ON PAPER BY DR. DEARHOLT

S. P. Withrow, Cincinnati: In discussing what is an adequate educational campaign we should first consider what is the scope of the work to be done to stamp out tuberculosis. I assume that there are two necessary methods of educational attack: First, to teach the consumptive how to avoid menacing others; second, to teach the well how to resist the disease.

The success of the first method depends upon our ability to find the cases and make them understand and heed.

The success of the second method unfortunately does not stop at making the people understand, for they may understand perfectly and yet be powerless to heed. And there is where our problem broadens and ramifies into all unwholesome conditions of society. The problems of housing, of the sweat-shop, of child labor, of low wage, of impure milk, of impure food, of intemperance, of the social evils, rise up before us and seem to become ours. To a certain extent they are ours, but we must combat them indirectly in coöperation with the great organizations that are at work upon each one.

It would seem—and I presume many believe—that consumption can be stamped out by simply employing the first method of educational attack, viz., to teach the consumptive how to avoid menacing others, but I am of the opinion that Moses, the first great health officer, was right when he says, in Deut. xxviii: 22, "The Lord shall smite thee with consumption and it shall pursue thee till thou perish."

Consumption is a social malady, and its entire uprooting will require wonderful social regeneration. An adequate educational campaign is, I think, an ideal aspiration, harder of achievement than to produce the perfectly smooth or the absolutely round in mechanics.

While I agree with Dr. Dearholt in most all his arguments, I do believe that an educational method that is successful in Maine will be successful in Oregon or any intervening State. A well-written advertisement inserted in a magazine of national circulation will "pull" in proportion to circulation in one State as well as in another. The expression of it should depend upon the class of people you would reach and not upon the section of the country. I believe it is important to tell a reason for enjoining people to do a thing. Simply to say "Use Pear's Soap" should be followed with the "why." "Don't cards" in our campaign would be more effective if they stated why. People should be told why they should do a thing. If they see the element of profit to themselves, they are much more apt to obey.

Any educational endeavor is of some effect, but to say what plan will produce the greatest results with the least expenditure is difficult indeed to express.

We are accustomed to classifying our efforts as educational or relief work. In reality it is all educational. The most valued effect of our relief work is the educational aspect. The day camp is simply a concrete illustration of the practicability of what we are teaching. We can hope, with the funds at our disposal, to serve but a small proportion of the sufferers of our communities, but the object-lesson reaches the home of all consumptives and bestirs some effort there in some way. It also awakens a sentiment for adequate State and municipal provisions, which is one of our chief aims. The same is largely true of a dispensary with its visiting nurses. So all our efforts might be properly defined as educational, and a well-balanced campaign will include the dispensary, and the day camp supporting and receiving the support of a campaign of school and club lectures, exhibits, educational pamphlets, and press notices. Every agency mentioned constitutes an important link in the chain for doing effective work. A live campaign con-

ducted along these lines will stimulate the work of other organizations that are working for social betterment in causes so vital to our success.

It is difficult fully to estimate the social, commercial, and political community value of a well-conducted tuberculosis campaign. I believe an annual Flag Day or Christmas Seal campaign, thoroughly organized so as to bring the greatest possible number of workers into the field, is an asset in an educational campaign of far greater value than the amount of money raised. It not only brings a great multitude of people into action, but it brings, with the nickels and dimes, the interest of almost every citizen, and it is interest that counts.

E. G. Routzahn, New York: Dr. Dearholt has brought to us a tremendously important subject in a very vital way. No campaign in the world's history probably has ever been given the amount of publicity and the opportunity to do educational work within a given time that the tuberculosis campaign has been given. Yet there has been a tremendous waste. It is heart-rending sometimes to see how much of effort and material and opportunity is thrown away because we have not gotten the viewpoint that has been brought to us in this paper, because we have not tried to find out how to teach the people. The tuberculosis campaigner must be an educator of a different type from the educator who has people in the class-room. The tuberculosis educator must be an educator who is an advertiser. The highest type of advertiser is the true educator. He remembers that he has not got folks in the class-room, but has to take them just where they are.

Our campaign has been inadequate in one direction because we have not been dividing it by topic. We have an address, we have a piece of printed matter, a newspaper article, with no particular relation. What we want is a division by topic. We want to get the whole community in a certain fashion to understand a certain idea. If we want a town to know what a nurse is doing for us, we will get a corps of speakers who will talk ten minutes. They won't begin 200 B. C. and tell the whole story of tuberculosis. They will have ten minutes, and they will talk about nursing for ten minutes. We will send them to talk to the people, to the lodges, the churches, clubs, and schools. We will go to the people—we cannot get them to come to us.

Dr. C. H. Lerrigo, Topeka, Kan.: I enjoyed this paper very much. I was particularly interested in the statement that you must adapt your work to localities. The thing that will do for a town of 100,000 will not do for a hamlet of 100. Mr. Routzahn said the people would not come to meetings. That is true so far as large towns are concerned. We will have to go to the shops and to the factories. But when you come to the hamlets,

the people will come, and you cannot get to them in any other way. There is no congregation of the people in a hamlet. The only thing you can do is to hold a meeting of some kind. In Kansas we have an appropriation of ten thousand dollars a year from the State, part of which we use for lecturing, and the only way we can get an audience is by using picture-films. They will come where we have three or four films put on, and our lecturer uses the films chiefly as bait, for most of them are not very good.

Dr. G. D. Porter, Toronto, Ont.: I trust I may be pardoned for intruding on this meeting, but, as representing the Canadian Association for the Prevention of Tuberculosis, I should like to mention what education has done in one province at least. It has been on the statute books of the Province of Ontario for some ten years that the Province would give one-fifth the cost of the building for any kind of a sanatorium, and $1.50 toward the maintenance of each patient per week, and yet there was nothing done until the public was educated. In the last three years, during which time the maintenance grant has been doubled, five municipalities have taken up the offer absolutely from this education of the public.

The Canadian Association is supported by the Federal Government, and our work is to go through the Dominion, trying to stir up interest in this movement. As an example of what follows I might mention that a few graduate nurses in the city of Toronto three years ago organized themselves into a society to look after tuberculous children. That society is now looking after fifty tuberculous children, and a gentleman whom they have interested has erected a preventorium for them.

Three years ago, in the city of Toronto, the local Board of Health took absolutely no interest in the tuberculosis problem. Today they have eight visiting nurses, 800 cases under their control, four dispensaries in the city, and they are now trying to keep pace with the National Association in every phase of the work. The work has more than doubled in Canada during the past three years.

When out in the park this morning I saw your magnificent Washington Monument. If you will look at that monument you will see that part way up there is a slight demarcation, dark below and pure white marble above. The lower portion was erected by private subscriptions, and after standing that way for many years, the government finally completed it. If I may use that as a simile, the tuberculosis campaign is a monument to human philanthropy and endeavor which the public has run up to one-third its height, and there it has stopped, and if it is ever to be completed, the govern-

ment must finish it, and this can be done, ladies and gentlemen, only through public education.

Frederick L. Hoffman, Newark, N. J.: On the question of dispensaries I want to say this with regard to the German system: the Germans are concentrating a large amount of effort upon adequate provision for living accommodations, which include radical reforms in the case of tuberculous persons sleeping with others or occupying rooms with others, as is practically unavoidable in a considerable number of cases. The dispensaries provide liberally for additional room rent, or they secure the needed beds and bedding, so as to eliminate the worst evils of overcrowding. The German dispensaries do not interfere with medical work, and, in fact, they strongly oppose the giving of medical advice, either through the dispensary physician or the visiting nurse. It is held that the function of the family physician should not be interfered with, and that the utility of the dispensary should be practically limited to advice on matters of personal hygiene and financial provision for urgent needs, particularly allowances for rent and food. At the information bureaus the members of families of tuberculous applicants are periodically examined, and drastic measures are sometimes adopted to remove the children from infected families. These children, to an ever-increasing extent, are taken to forest homes or seashore colonies, whether they are tuberculous or not. It is quite probable that some time in September the Bureau of Labor will publish a full account of the treatment and care of tuberculous wage-earners in Germany, with a discussion of dispensary methods as developed in the principal German cities.

Frank E. Wing, Chicago: If I may be permitted to go back, I would like to discuss for a moment Miss Crowell's paper, particularly the matter referred to by Dr. Bishop, namely, that we are coming to the time when one nurse will do all kinds of nursing work. I agree with Dr. Bishop in a measure, but I do not believe that at present we are ready to go quite to that length. It seems to me that the fact that our nurses at present are not trained as well as they should be to do tuberculosis work is sufficient reason why they should not yet be asked to undertake all the various forms of social service nursing. I believe that facilities should be provided to enable nurses who are in training to get an opportunity to secure experience in tuberculosis work. As you all know, our general hospitals will not admit patients having tuberculosis. The result is that our tuberculosis nurses do not begin to get any training in tuberculosis work until they become members of a visiting tuberculosis nursing staff. Now, one thing that we are working toward and endeavoring to carry out in Chicago in connection with the tuberculosis work

is to provide an opportunity for nurses in training to get some special experience in tuberculosis work. We have already put into operation an arrangement with one of the Chicago training-schools whereby that training-school sends to one of the dispensaries of the Municipal Sanitarium a nurse for one month, this one month's period being one of the last months during her period of training in the training-school. This plan has been in operation since the first of January, and last week arrangements were made for the extension of the same provision to another training-school. We hope that more training-schools in Chicago will take advantage of this opportunity to make the dispensaries a means of training for nurses in tuberculosis work.

I feel that I must also disagree with Miss La Motte as to what should be the purpose of the tuberculosis dispensary. It seems to me that if we should make the dispensary merely a place for diagnosis, the dispensary will lose a very large percentage of its usefulness in the community. After the diagnosis is made the nurse goes into the home, and is very often the means of bringing other members of the family back to the dispensary, resulting in the discovery of early cases of tuberculosis. I believe if we are to secure the best results in control and treatment at home, the patient must revisit the dispensary for consultation with the physician at stated intervals.

Mrs. I. H. Welling, Trenton, N. J.: Mr. Wing said that he hoped to see the time when every hospital board would refuse to give a full certificate for nursing to a graduate nurse unless she had had at least one month's training in tuberculosis. In nearly every large city this is now possible. They can get one month's training in a tuberculosis dispensary or hospital, or it could be arranged if necessary that every hospital have one room or one tent on the ground for tuberculosis patients, for the express purpose of giving the nurses this training that they need the moment they go outside the hospital.

Miss Ellen N. La Motte, Baltimore: I should like to correct an impression that some of the speakers may have got from my remarks. Although in Baltimore we use our dispensaries mainly for diagnostic purposes, the patient who goes to one never gets rid of the nurse until he dies. Even if he goes only once, the nurse never ceases to visit him in his home. We follow him through the hands of all the doctors of the city; through all the dispensaries; and if he goes into a sanatorium or a hospital, as soon as he leaves the institution he is referred back to us again. That is the advantage of having all the visiting nursing done by one central agency—the tuberculosis nurses of the Health Department.

CLINICAL SECTION

Chairman

CHARLES L. MINOR, M.D.

Asheville, N. C.

Secretary

GORDON WILSON, M.D.

Baltimore

INTRODUCTORY REMARKS

The Chairman: In opening the meeting of the Clinical Section it has been the custom, from which I shall not depart, for the chairman to make a few opening remarks.

The program, which you have all seen, speaks for itself, I believe, and I trust will interest you.

I have sought to collect for your consideration papers by men whose names guarantee the value of their contributions on certain subjects which are of present and large interest to workers in this line, and which need further study and discussion, and let me here note that whatever the value of any paper which is presented here, it is at least equaled by the value of the full, free, and fair discussion which it is purposed to excite.

Although twenty-two years have elapsed since tuberculin was brought to the attention of the medical public, although it has had, especially in the past few years, ample trial, and although our present view of it is, I may fairly say, distinctly favorable, it is yet unquestionable that its value is by no means yet a therapeutic "res judicata," and that the indications for and limitations of its use are far from being finally settled. We need, therefore, all the light we can have on its application as a therapeutic measure and on its dosage. Further, the profession outside the ranks of the specialists are very generally unfamiliar with its use diagnostically, and with the indications for and the relative value of the cutaneous, the percutaneous, the ophthalmic, and the subcutaneous methods of its application, and especially too many doctors are trusting to the cutaneous method for the diagnosis of this disease in adults.

I have therefore asked three men with wide experience with tuberculin to give us their views of the therapeutic and diagnostic uses of this drug, and I trust it will call forth full and free discussion.

Therapeutically, today the most discussed measure before the profession is artificial pneumothorax, on which we are all anxious for more light, and I trust that the papers on this subject which we are to hear will send us home more fully informed on the matter than most of us are at present.

It is needless to say that the diagnosis of tuberculosis is always of paramount importance, as on it alone can rest any rational therapeutics, and I have therefore asked one of our leading diagnosticians to talk to us on this matter, while the very live subject of the exact diagnostic value of the *x*-ray will be discussed by one of large experience in the matter, well controlled by constant comparison with the results of the best physical diagnostic work.

All of us, at times, as we look over our case records, wonder what are the actual results finally yielded by our modern methods of sanatorium and dispensary treatment, and hence I have asked two prominent workers in these lines to favor us with their experience on the subject.

There are also many valuable therapeutic measures which while perfunctorily recognized, the profession as a whole neglect, and yet which would be of great value if they were systematically and intelligently applied. Few of these are more useful than hydrotherapeutics, which I have for years used regularly and with the greatest benefit and which would have a larger use had not the elaborate paraphernalia often recommended discouraged it. The foremost worker in this line in the United States will open this section today with a discussion of the subject, and I trust it may induce many to give it a more intelligent trial.

We also have several valuable papers on other subjects which I trust we will have time to hear and discuss, although unfortunately the time at our disposal is limited, and it may be necessary that some of these papers be read by title.

In this connection let me say that in view of the shortness of time I shall strictly enforce the Association's rule, and allow but twenty minutes for each paper and five minutes to each man discussing it, and that it will be impossible to depart from this rule, much as I regret that we cannot let many excellent talkers who are present entertain us more at length.

There comes up before us today a matter of much importance to which I trust you will give your most careful and serious attention.

As you know, our Association has been for some time discussing the adequacy of our nomenclature descriptive of the condition on discharge of our patients. The question of the justice and value of the terms "arrested" and "apparently cured" on discharge have been questioned, and a committee from this Association was appointed to consider this matter and report. At the same time the Sanatorium Association, which is naturally most concerned in the subject, appointed from their ranks an identical committee which reported yesterday to that Association. Those same

gentlemen, acting now as our committee, will report to you today. The whole matter is worthy of the most serious discussion, for we must consider both the demands of the truth and the effect upon an ignorant public of the terms we use relative to their condition on discharge.

We all recognize, as of course they cannot, that an anatomic cure is impossible, and that the best we can hope for is a clinical cure, or perhaps I had better say a full restoration to working efficiency, which is what the public considers a cure. The effect of any statements we publish upon that public must be seriously considered, as all of us who have noted the eagerness with which patients inquire of us as to these distinctions and the extreme difficulty of making clear to their minds what these terms imply to us will be clear.

Dr. Brown will read you the report of which he is the author and which has, I believe, the concurrence of all his committee, and I trust that the discussion will be full and free, for in many ways this is the most important subject which will come up at this meeting of our Association.

Finally, it is my hope that what we shall hear today and tomorrow in papers and discussions will prove stimulating to us all, and cause us to go home prepared to do better work than ever in the great fight in which we are engaged.

THE EXTERNAL USE OF WATER FOR ENHANCING RESISTANCE IN TUBERCULOSIS

By Simon Baruch, M.D.
New York

The renaissance of tuberculosis management was initiated by Brehmer of Goerbersdorf, who in the face of criticism, ridicule, and obloquy, persisted in the claim that tuberculosis is curable by the physiological agencies—air, water, exercise, rest, and diet. These remedial agents are fully treated in every American work and they have been the frequent theme of discussion in this society—*with the exception of water*. It is the purpose of this paper to rescue the water from unmerited neglect and to show that the latter originates in unfamiliarity with the principles and practice of hydrotherapy.

In 1892 I presented to the New York State Medical Society an address on "The Successful Management of Chronic Diseases," in which the value of the methodical application of remedies, and especially of water, was distinctly brought out. Pulmonary tuberculosis was selected as a striking illustration of my theme. The marvelous results from the methodical graduated application of cold (below skin temperature) water in phthisis pulmonalis was demonstrated by clinical histories from the records of the Montefiore Home for Incurables (now called Home for Chronic Invalids and Hospital for Consumptives). I indulged in no generalizations, but sustained every statement by bedside facts, citing cases in all stages of the disease in which the improvement in nutrition, with gain in weight and general vigor, was phenomenal, resulting in return to their vocation in some instances and even in remaining capable of work for several years. These patients were under constant observation of some of the staff of eighteen physicians; their sputum was examined by Dr. Hodenpyl, pathologist to several hospitals—there was no possibility of error. In none of them—and I want particularly to emphasize this fact—did the open-air treatment, the most potent of all anti-tuberculosis remedies, play a rôle. For despite the fact that in the planning of the building I had insisted upon a costly and perfectly equipped Liegenhalle, heated in winter and opening to the south, it proved impossible

to induce these desperate people to submit to discipline by reason of the mistaken kindliness of the directors, whose chief aim was claimed to be to soothe their dying days. Nor did I interfere with the medication even when it did not meet my approval. In view of these facts it may be claimed that *the favorable results were chiefly due to the methodical application of water* and the good food, for which they would have had no appetite without the tonic action of the latter. Moreover, they had, previous to admission, been treated *secundem artem* in our best hospitals and by competent private physicians and consultants, with the sole exception of water, which at that time was not systematically used by any one in this country.

Seven years later our worthy colleague, Dr. Adolphus S. Knopf, published his excellent work on Tuberculosis, in which he described several procedures and emphasized their importance. Since that time I have come across only three books on tuberculosis by American authors which make mention of the subject. One displays contempt and absolute ignorance of the uses of water, despite the fact that its 300 pages are an otherwise good work. This author writes: "Well-selected tonic medicine is worth incomparably more than baths. Unfortunately, most experimentations with baths have been done by specialists in hydrotherapy, a circumstance not conducive to unbiased reports." The absurdity of this comment would reveal itself to the author even if he would replace the word baths by tuberculin and hydrotherapy by tuberculosis. Compare this tirade of a man ignorant of hydrotherapy to the encomiums of a great teacher like von Ziemssen or Brehmer, Dettweiler, Cornet, and others who gratefully commend these "specialists," and you will not regard my comment unwarranted.

A second, more pretentious, and in other respects able work does not mention hydrotherapy except to state that "dietetic and hydropathic means often suffice to cause disappearance of night-sweats." This author's dread of water is amusing; he never advises it without adding vinegar, alcohol, chloral, or brandy, a practice which von Ziemssen has very properly condemned long ago.

Another text-book on tuberculosis, consisting of contributions by American authors, dismisses water with a few vague lines on cold baths "for hardening, and mustard foot-baths and sponging for temperature reduction." None of these latest American works mention the principal action of water—improvement of nutrition and stamina. Contrast Knopf or Cornet or any complete work or the views of Brehmer, the father of phthisiotherapy, with these authors and you will fall into sad reflections on the lack of knowledge

of American tuberculosis authorities on the subject of hydrotherapy. The latter is also illustrated by the following incident—I cite it to sustain my contention. During a recent visit to a magnificent hospital for tuberculosis now in course of construction, I found that each floor of each of the six pavilions was supplied with a complete douche-room, which, among other features proving ignorance of technic, was arranged so badly that the doucheur would receive water rebounding from the patient. There were twenty-four douche-rooms for 600 patients! Expressing surprise at this lavish expenditure, the architect explained that he had been informed that a hydrotherapeutic plant was essential in every up-to-date tuberculosis hospital, and since he aimed to excel all other institutions, he placed a douche-room in every ward, so that the most helpless patients would not be deprived of the beneficent water treatment! He certainly is building an institution which is complete and praiseworthy in every other respect except in cost. My comment that one douche-room would probably suffice for the entire institution, since it is intended for advanced cases and would therefore present but a small percentage of ambulant cases fit for the douche, was met with the statement that none of the tuberculosis experts who had examined the plans and had inspected the hospital since the douche-rooms were actually laid out had criticized the latter, though they had not spared him in other respects. Nor was he entirely satisfied until I had shown him the Riverside House Hydriatic Department, in which 100 to 150 treatments are sometimes given in ten hours in one douche-room, and the Vanderbilt Clinic Hydrotherapeutic Department, in which twenty-five patients are often disposed of in two hours. About $120,000 was the cost of this unnecessary douche-room arrangement, besides the valuable space wasted. This expenditure applied to incipient cases would restore many to health and earning capacity.*

Another mistake which will do much damage if this warning be not heeded, and which I pointed out in vain to the architect, was the instalment of an electric-light cabinet in each douche-room. This apparatus is useful chiefly for rapid production of diaphoresis and its suggestive effect. The former is exhausting and therefore injurious, and the latter is unnecessary in the advanced stages of tuberculosis. It is hoped that the physicians who

* The fallacious idea that a hydrotherapeutic plant is essential to an up-to-date hospital often comes under my notice, since I am frequently consulted on this subject. Only a few months ago the plan of an extensive hydrotherapeutic department for a hospital of 500 patients was submitted to me for revision and suggestions. I advised against it because there was no large outdoor department. In another costly hospital my advice to the same effect was disregarded: the apparatus has never been used.

will take charge of this great hospital may study hydrotherapy in some good text-book before they venture to utilize the still abundant facilities for hydrotherapy.

Now for the other side of the picture. I was delighted to note that this society has not been altogether oblivious to the upbuilding action of water True, this agent is rarely referred to in the Transactions, but whenever Knopf, Pottenger, Meyer, or Barlow have spoken, they have displayed a correct idea of its aims. At every meeting climate, exercise, diet, rest, and tuberculin have been fully discussed. At only three meetings do I find water mentioned and in the most casual manner.

I plead today for the restoration of this potent agent for enhancing resistance to the legitimate position assigned to it by Knopf, who wrote, "Hydrotherapy comes next to aërotherapy."

For forty years water below the skin temperature has been constantly a part of my therapeutics of pulmonary tuberculosis. Prior to 1880 a residence in Camden, S. C., brought a number of these cases under my observation; its proximity and climatic similarity to Aiken made this town quite a resort for consumptives. Not, however, until I became chief of the medical staff of the Montefiore Home for Incurables did an opportunity present itself to utilize water on an extensive scale and with intelligent co-operation. In 1886 a small appropriation was ironically granted me by the directors, who regarded the restoration of any of these incurables as chimerical. The astounding results obtained in phthisis and other intractable diseases brought a larger appropriation and contributed no little to the change of title from "Home for Incurables" to the present title. The records of this institution tell their own story. Some of them were published four years before I visited Goerbersdorf and Frankenstein. My faith in water for enhancing resistance was nurtured by von Ziemssen's classical lectures on phthisis pulmonalis. In the tenth lecture he said: "I cannot close this chapter on Prophylaxis without mentioning hydrotherapy, which here as well as in developed tuberculosis plays an *extraordinarily important rôle*. I recommend for your special study Winternitz's excellent monograph on this subject. My observations are in entire accord with those of Winternitz.

"Water is the most simple strengthening and hardening remedy; it may be used everywhere and by every one. Even the most simple lukewarm rubbing down of the entire body on leaving bed (reduced as he describes later) exercises the nerves and muscular system and conduces to prompt reaction, refreshing and stimulating the nervous system and reflexly the

respiration, circulation, and digestion. It may be used in the poorest families. There is no advantage in brandy and salt rubs. The shock-like action is demanded. The great advantage of cold rubbing is that it may be applied at home by even an inexperienced person, and its good effect may be obtained for months and years by daily practice, especially among the less well-to-do, all of which give it extraordinary value."

The present generation of physicians cannot realize the high standing of von Ziemssen as a clinical teacher and observer; to my youthful mind his dictum was gospel and I have had no cause to regret this faith. When I visited Brehmer's, Roempler's, and Dettweiler's Sanatoria in 1896, it appeared to me that the douche was given at too low a temperature (it was 47° F. at Falkenstein) and too strong from a large shower. I was informed, in reply to this comment, that only patients already improving were judiciously subjected to this douche, and that the reaction was cautiously guarded. In the Montefiore Home, on the contrary, which at that time received no incipient cases, almost all patients received mild neurovascular training; *i. e.*, the graduated application of cold water. Thus has happily demonstrated the superiority of the mild procedures over the heroic douche method.

The following syllabus was prepared for the students of my department:

Vanderbilt Clinic—Department of Hydrotherapy

TONIC HYDROTHERAPY

Graduated neurovascular training. Cardinal rule: All water applications below 90° F. must be made with friction.

First Stage—ABLUTION

Avoid extremities below knee and elbow. (*a*) Begin with 90° with saturated linen cloth or gloved hand. (*b*) Pass rapidly over successive parts. (*c*) Dry thoroughly. (*d*) Dress and exercise in open air in ambulant cases. (*e*) Reduce temperature of water daily 2 or more degrees, until 60° is reached.

Second Stage—AFFUSION

(*a*) Patient stands in water at 105°. (*b*) From a bucket of water at 85° water is dipped and thrown over back, each shoulder, and chest. (*c*) Dry, dress, and exercise in open air. (*d*) Reduce water temperature daily 5 degrees or more, to 60° F. (*e*) If reaction is good, proceed to third stage.

Third Stage—COLD RUB

(*a*) Patient stands in water at 105° F. (*b*) A linen sheet is *wrung* out with water at 80°, decreased daily. (*c*) Damp sheet is wrapped over body

snugly. (*d*) Patient is actively rubbed over sheet until sheet is warm. (*e*) Dry, dress, and exercise in open air. (*f*) Reduce temperature of water 5° to 10° daily to 50° if reaction is good. Then proceed to drip-sheet.

DRIP-SHEET

(*a*) Patient stands in water at 105° F. (*b*) Upper edge (12 inches) of linen sheet is gathered into folds. (*c*) Sheet is dipped in water at 80°. (*d*) The dripping sheet is held by attendant while patient wraps himself into it by turning the body. (*e*) Friction and slapping with flat hands for two minutes. (*f*) Pour water at 70° over shoulders. Rub and slap again until sheet feels warm. (*g*) Repeat this over successive parts of body, rapidly. (*h*) Sheet removed. Patient dries, dresses, and exercises. (*i*) Reduce water temperature daily until 50° is reached.

I have coined the words "neurovascular training" in order to emphasize the fact that there are few, if any, cases that may not be profitably subjected to a graduated, daily increase of cold water, reducing the temperature, and increasing the duration slowly, and in institutions adding the pressure from the douche. By this method the capacity of the nerves and vessels of the skin and its muscular structures which control the capillaries may be trained to respond with increased vigor, just as the muscles of the arm may by slow and graduated accretion of weight be trained to lift heavier weights.

In small sanatoria and in private practice the douche may be dispensed with.

I heard a teacher of hydrotherapy in Vienna say, "the douche must always be given strong and cold." The application of the douche in this indefinite manner has done much harm. Especially in tuberculosis is it fraught with mischief and has done much to discourage its popularization. In careful, skilled hands this idea would exclude many feeble patients, while in careless hands life and health would be endangered. Brehmer dwelt on this danger, insisting that the douche be always administered by a physician. I apprehend that despite his praise of this procedure this just caution has deterred many from its use in appropriate cases. With the apparatus I have devised for institutions, the duration, pressure, and temperature may be so accurately applied that the patient may be gradually trained to accept it without harm. This is proved by some of the Montefiore Home patients, who were so well trained by the graduated hydrotherapy preceding the douche that many refused a five-minute rain douche of higher temperature than 65° F., a procedure from which most of us would shrink. That this douche table is absolutely foolproof is evident from a record of over 50,000 treatments in three institutions during the past twenty

years. For tuberculosis cases in institutions I have devised a more simple and less expensive wall apparatus.

The difference between the slow and cautious neurovascular training and the heroic douche treatment is illustrated by two sanatoria that are under equally skilled direction. In Budapest St. Elizabeth Hospital Dr. Kuthy uses the former; he reports one thousand cases in the first stage treated with tuberculin and the most approved dietetic and hygienic régime, of which 53.9 per cent. were discharged as clinically cured, while at the Belzig Sanatorium only 39 per cent. recovered. The only difference in the management of patients in these institutions was that Kuthy used a graduated hydrotherapy adapted to each patient's condition from the beginning, while at Belzig the douche is the principal procedure. Kuthy does not regard any case as cured until two years have elapsed without manifestations. These data are cited to show that individualization is important, and that although both physicians individualize carefully, one loses the best action of water because he awaits, as did Dettweiler, the patient's tolerance of douches.

Unfortunately for its universal adoption, water is used irrationally on merely empirical grounds. A rational basis underlies its action. What is the rationale of water in tuberculosis? Taking pulmonary tuberculosis as an example, the indications are to improve nutrition and hematosis, to elevate the patient's stamina in order to enhance resistance. During the last quarter of a century I have not prescribed medicinal tonics for any patient because systematic *neurovascular training*, which may be administered in any household, has been effective in the improvement of appetite and in the increase of blood-cells and muscular and circulatory capacity, as evidenced often in gain of weight and general vigor. This statement is based on hundreds of blood-counts and weight-records. The rationale is so simple that I would fain omit it here, were it not invariably disregarded in the text-books which properly detail the action of all medicinal agents. The so-called shock from cold water is dreaded without reason; it is not, like surgical shock, "a depression of the vital powers," but rather a surprise to the cutaneous nerve terminals, furnishing thermic and mechanical excitation, which, as we learned in our student days, is conveyed to the central nervous system and thence reflected upon all the structures in connection with the latter. Pardon my using a trite but emphatic illustration—the gasp of a still-born infant on receiving a dash of cold water. In fact, the management of this type of "asthenia" offers an epitome, as it were, of hydrotherapy. Do we not increase the dose of temperature stimulus by dipping the

entire body into cold water, when the smaller dose—sprinkling—fails to arouse the waning vitality? And do we not again increase the so-called shock by contrast of the alternating action of hot and cold water dipping, when needed to resuscitate the patient? Alcoholic or medicinal stimulants are not thought of in this sudden demand upon our therapeutic resources. Why has custom established cold water as the only stimulant in this most pathetic of all asthenias? Because the empirical good results are based upon rational physiological principles and no other stimulant is capable of accomplishing such marvels of restoration. You may apply the principle here involved—*temperature excitation judiciously adapted to the patient's reactive capacity*—to every other form of asthenia. In tuberculosis, for instance, you may obtain precisely the same effects for the same reason. This is true science, more than can be said of some of our "best remedies." Individualization is imperative; its neglect brings disappointment and failure, often resulting in abandonment of an agent that has possibilities unthought of. That the dash and the dip would be futile in typhoid asthenia and that the cold bath would be fatal to the infant "goes without saying." I have formulated a hydrotherapeutic law—the effect of a hydrotherapeutic procedure is governed by the difference between skin and water temperature. This is modified by psychical and physical conditions which are easily learned by a little observation and practice. To avoid faulty hydrotherapy and make it more universal, I have devised neurovascular training, which furnishes a daily test of reactive capacity and by which all harm may be obviated in the most depreciated case. The effect of neurovascular training upon the circulation is marked by reason of the vasomotor stimulation which primarily affects the smaller vessels. In addition there is an action upon the "skin-heart" which has not been sufficiently appreciated. I hold that since the capillaries have no muscular nor elastic coat, their narrowing under cold water is due to the cutaneous muscular fibers which are contracted by the cold. These compress the capillary network with which they are interwoven, and thus aid the vasomotor action by increasing the resistance at the periphery. The result is an immediate response of the heart, with increased ventricular contraction and all the potent influences flowing from an enhanced cardiac tone, removal of stases, exudates, and enhanced nutrition and elimination. Moreover, the well-known favorable action of cold procedures in other infectious diseases evoked by their effect on the peripheral circulation may be expected in tuberculosis also. This is a clinical fact observed in febrile cases especially.

There is one action of water procedures which has not received sufficient

attention, viz., the remarkable influence of cold and warm water upon the muscular system. Vinaj and Maggiora, of Turin, have given us some valuable laboratory data on the enhancement of muscular vigor by cold water and its diminution under warm water if given without the mechanical stimulus of atmospheric pressure. By repeated experiments with the ergograph of Mosso, to whom they submitted their results, they ascertained the fatigue curve (line) before and after water procedures of various kinds. The middle finger of the right hand, for instance, was made to contract with the greatest exertion, lifting a weight of one kilogram until fatigued; the point of exhaustion was reached after 50 contractions, two seconds apart (Fig. 1). This was calculated to correspond to a total of 5.139 kgm. work, while after a plunge bath of fifteen seconds at a temperature of 50° F. the same finger was capable of completing 74 contractions before fatigue ensued, corresponding to 9.126 kgm. work (Fig. 2).

In an interesting article on the rationale of rest, published in the May number of the "Journal of the Outdoor Life," by Professor Lee, of Columbia University,* the effect of rest is shown in a diagram which I reproduce (Fig. 3) in order to show that a similar effect is produced by cold-water procedures. In Fig. 5 the fatigue lines are shown after muscular action; Fig. 6 shows how the lost muscular vigor was restored by the cold wet sheet.

Professor Lee writes: "There is no known antidote for fatigue (with its detrimental products) unless it be rest." Figs. 5 and 6 demonstrate that there *is* another antidote, and a much more powerful one, namely, cold water administered with friction. The chief physiological action of cold-water procedures is, first, the beneficent effect of exercise upon the unfatigued muscle and, second, the good effect of rest upon the fatigued muscle. We therefore obtain from judicious graduated cold procedures an improvement in the circulation of the blood and lymph, enhancing cardiac activity and driving the venous and arterial blood and the lymph through unwonted channels, washing out fatigue products and other elements of defective tissue change. The advantage of muscular enhancement by water over that produced by active muscular exercise in tuberculosis is enormous, because the former causes no active disturbance of the respiratory process which would menace the consumptive. Too often, also, absolute cessation of exercise is demanded by reason of rise of temperature leading to loss of valuable tone, when cold water proves a precious substitute.

My limits do not permit me to enlarge upon the rationale of the action

* "The Physiology of Rest and Exercise," Frederic S. Lee, Ph.D., Journal of the Outdoor Life, May, 1912.

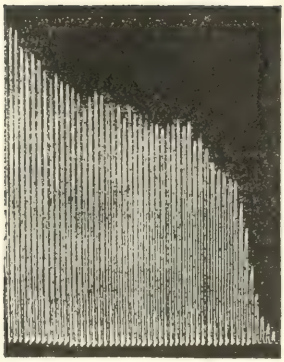


*Fig. 1.—Normal Fatigue, Right Hand. Before plunge at 50° F. Fifty contractions. Raised 5.139 kgm.

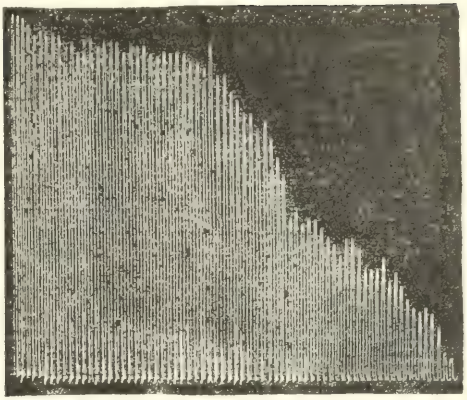
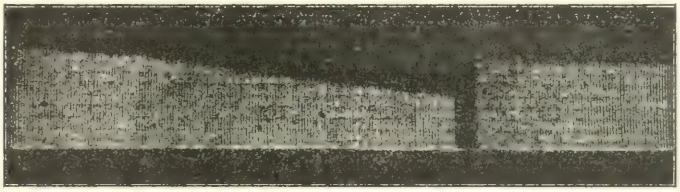
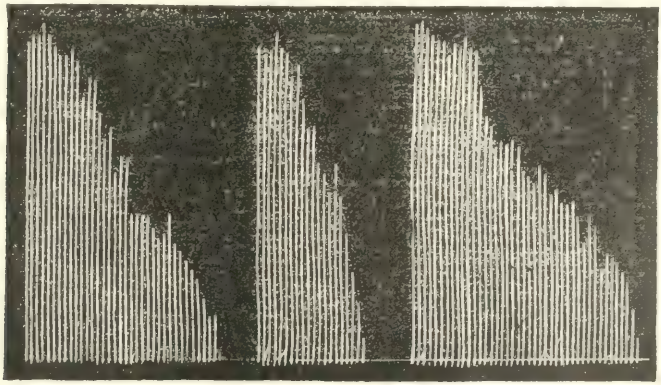


*Fig. 2.—Fatigue, Right Hand, after Bath, 50° F., for Fifteen Seconds. After plunge at 50° F. Seventy-four contractions. Raised 9.126 kgm.



† Fig. 3.—Series of Contractions of a Frog's Gastrocnemius Muscle *in situ* and Stimulated at Intervals of Two Seconds. At the Break in the Series the Muscle Rested Five Minutes.



* Fig. 4.—Normal Fatigue Curve. * Fig. 5.—After Labor. * Fig. 6.—After Application of Wet Sheet.

* From Principles and Practice of Hydrotherapy, William Wood & Company, New York.

† From Journal of the Outdoor Life, May, 1912.

of judicious and graded hydriatic procedures; these are fully detailed in Chapter V of my book, "Principles and Practice of Hydrotherapy."*

When all its briefly enumerated effects are considered, it may be claimed, without fear of contradiction, that hydrotherapy should occupy a high plane in the management of tuberculosis if it were applied rationally as is here outlined. Owing to the lack of training, faulty methods prevail in otherwise excellent institutions in which the good results now obtained would be vastly multiplied by improved methods. For instance, in one large institution the patients are permitted to take their showers as suits them, while in another the patient stands on a glazed brick floor with the cold water flowing upon his feet; the latter should always be protected by a slat floor, because their chilling interferes with general reaction. Moreover, the shower is not so stimulating as the fan douche, which strikes every part treated with friction and may be confined to definite portions of the body, as demanded by reactive capacity.

The wonderful results of graduated exercise claimed by Marcus Patterson, of the Brompton Hospital for Consumptives, are the result of judicious gradation. He applies exercise as I have applied water, beginning with mild forms and slowly, carefully rising to more active methods. This is the secret of success, and it is simple enough to enlist imitation.

Another precious advantage of systematic water treatment of tuberculosis lies in the fact that when the patient returns (cured or arrested) to his unfavorable environment the daily neurovascular training has become an imperative need for him. Dr. Rosenberg, of Bedford Hills, informs me that he often meets discharged patients who express their craving for the shower-bath, which they satisfy in the public baths where showers are the rule. They are not always able to sleep with open windows because other inmates of the room object to cold air, but they can readily obtain the cold shower and thus protect themselves against relapses by enhancing resistance capacity in another way.

In conclusion, I would say that these comments are the result of my disappointment in finding hydrotherapy discussed so little in American books upon, and societies connected with, tuberculosis. If colleagues are using it, they have failed to realize its importance and have not published their results. I hope that today's discussion may be confined to actual clinical or laboratory investigations, as I have endeavored to present.

I have been more frank than is my wont, because of the pressing demands of suffering humanity, and, having passed the biblical span of life, another

* Wm. Wood & Company, third edition.

opportunity may not be granted me. This is my warrant for urging upon every tuberculosis specialist that he investigate the rationale and therapeutic action of water and try in every case the method of neurovascular training, which may be practised in the most humble household upon the most depreciated subjects without harm.

I am ready to demonstrate all I claim, to any one interested in the subject, in the institutions and clinic with which I am connected.

DISCUSSION ON PAPER BY DR. BARUCH

Dr. S. Adolphus Knopf, New York: I am very glad that hydrotherapy in tuberculosis has been brought before this section by Dr. Baruch, whom we all know to be an authority on this subject. The reason hydrotherapy is not used more in the United States is, I believe, because its method of application needs to be simplified. I believe water is of great therapeutic value in the treatment of tuberculosis, as well as other diseases, but if we desire to have it widely used and give the benefit of it to as many patients as possible, we must simplify its application even more than is indicated by the apparatus just shown. I will describe very briefly the method I recommend:

The room should be comfortably warm, the windows closed in cold weather. An English bath-tub containing about five inches of warm water is placed near the bed. Next to the tub a wash-basin filled with cold water is put on a table or stand. When beginning with these hydrotherapeutic applications in winter, the cold water should be tempered so as to accustom the patient gradually to the shock. If the douche is to be given during the day-time, the patient goes to bed for twenty or thirty minutes. When thoroughly warm, he rises and steps nude into the warm water; he then soaks a sponge in the cold water, which he squeezes out once over the back of the neck, once in front over the sternum, once over the left and once over the right shoulder. The cold water will have thus reached every portion of the body except the head. He dries himself rapidly, though not necessarily thoroughly, and then returns quickly to bed, which should have been covered when he left it to retain the warmth. By this method reaction is assured, and this, gentlemen, is the most important thing in hydrotherapy. Cold water applied no matter when, where, and in what cases is injurious if prompt reaction does not follow. You will be surprised how much can be done in tuberculosis with this simple and safe method of using cold water as a means to lessen the susceptibility to contracting colds, and as a tonic and stimulant to nutrition. Applied as a pack or in the form of partial sponging, cold water is, of course, also invaluable as an antifebrile remedy.

Dr. W. Jarvis Barlow, Los Angeles: The public owes much to Dr. Baruch for his enthusiasm. His pioneer work in California has placed at least two apparatus in two sanatoria. I owe much as a pupil to Dr. Baruch, and cannot say too much of the help I have received from him in hydrotherapy. In tuberculosis work we use in our sanatorium cold water as a routine treatment. The cottage system we use is not a disadvantage in this treatment. We have detachable showers, which we require the patients to use each morning and then get back into bed for a few minutes before dressing. This is after Dr. Baruch's plan.

I should like to ask Dr. Baruch in regard to warm baths for tuberculous patients, and whether he thinks a cold shower should be given afterward.

Dr. Joseph E. Gichner, Baltimore: Hydrotherapy lends itself clinically to the symptomatic treatment of cases. I believe cold packs over the chest would relieve much of the pain, both muscular and pleuritic.

In hemorrhage cases there is often no need of the ice-bag, which, if left on too long, defeats its own object. After six or eight hours' application an ice-bag brings about a localized anesthesia and paralysis of the vessels and tissue beneath, and there is a blue, practically dead skin, which carries no impulses. The sensible application of cold packs in hemorrhage is often of quiescent effect and controls hemorrhage by resting the patient and causing superficial hyperemia.

The use of a general cold pack, in febrile cases, which is not a severe measure, should be understood. The patient is wrapped in a sheet wrung out of cold water, 65° to 70° F., a blanket over this, and the bed protected with a rubber sheet. I believe hydrotherapy can be applied in the most humble home without apparatus. The method we use in the sanatorium, a morning douche with friction as tonic, could be easily applied at home, except that it needs another individual to apply it.

The Chairman: I think there is a distinct need for the popularization of hydrotherapy among the profession. It has never had the systematic use it deserved, owing, I believe, to the elaborate apparatus which its advocates have often recommended, and if it is to be adopted, the apparatus must be simple and easily used. I have used hydrotherapy systematically myself with pulmonary patients for years with no more elaborate apparatus than a tin tub, a bath thermometer, a big sponge, and a rough Turkish towel. My own procedure is to have the patient jump warm from his bed into a hot tub containing water at the proper temperature, which in the beginning is that of the blood, and gradually worked down to 60° F. and sometimes lower. The patient then uses the sponge to squeeze the cold water over his back,

then over his chest and abdomen, then down his arms and legs, giving thus a quick shock. Then he jumps out and dries briskly, and continues with his toilet and does not go back to bed. The only contraindications I have found are in rheumatism and some heart cases, and in patients tending to hemorrhage, and in those who do not react, but are blue and chilly afterward, although few will fail to react if it is gone about rightly. The beneficial effect in curing patients of their tendency to frequent colds is remarkable, and you will find few patients who, once adopting it, will be willing to give it up.

Dr. Simon Baruch, New York: I have endeavored, in teaching, to encourage the general practitioner to use the douche at home. The douche I have designed is to be used in a clinic with about 150 patients. Five patients are treated at once. Temperature, pulse, and duration are registered every day. If any of you gentlemen will visit us in New York, we will be glad to show you the treatment.

My principal object in reading this paper is to urge you to try the water treatment on every patient. I do not care how debilitated he is. Some of them have never had a bath of any kind in their lives. In these cases we begin with a soap and water bath, then wrap them in warm blankets for about an hour; give two ounces of ice-water every few minutes internally; then take a basin of water at 90° F. and throw on the chest and rub hard, then on back and abdomen and lower extremities. The next day reduce the water to 85° F.; the next day to 80° F.; then to 70° F.; then to 60° F. Sometimes we use gloves dipped into the cold water and rubbed over the patient, dropping 5 degrees each day. When we get down to 60° F. we then begin again at 90° F. We treat every single patient this way, no matter how debilitated. All you have to do is to be sure of a reaction. I think for rheumatism it is very useful. I use a cold wet pack in acute and subacute nephritis. I could show you, if I had time, that whenever you get a reaction after a cold bath it is more useful than heat in nephritis. It does not produce perspiration, but it unblocks the kidney.

Dr. Knopf probably misunderstood me. I do not think he said a word about temperature. He said use it cold. That I do not approve of. I use water at a definite temperature. You do not tell a patient to get strychnin or digitalis from the drug-store. You give a definite order. Bath has temperature and duration. Put your hand in water at 60° F. and rub it and you have a nice reaction. The same person, same bucket of water, but a different duration, and you get a different result. We must have intelligent application. When Millet was asked how he got those

beautiful colors, he said, "Why I mix them in my brain." We must apply the same intelligence as the painter. It does not require a specialist. It seems to me any intelligent man can use it. One authority has said that all we need for hydrotherapy is a wet rag, a towel, and a thermometer.

If you use hydrotherapy in every case, I am sure you will get good results.

THE PRESENT STATUS OF THE THERAPEUTIC USE OF TUBERCULIN

By Lawrason Brown, M.D.
Saranac Lake

In the short time at my disposal today it will be impossible to enter into many details of the therapeutic use of tuberculin, and I shall confine my remarks largely to my personal experience with tuberculin.

In tuberculin treatment it is necessary to bear clearly in mind what tuberculin is. Apparently tuberculin produces no antitoxin and kills healthy animals only in such large doses that it cannot be called a toxin. It is, however, a poison, and a very potent poison, for a tuberculous individual. Immunization to tuberculin is, therefore, an active immunization.

The action of tuberculin in the body has been much discussed and is even yet far from settled. If we take, *e. g.*, an animal in which some early tubercles exist, we may picture them as being composed of focal, epithelioid, and other cells, containing tubercle bacilli in all stages of disintegration. The protein of the tubercle bacilli has been set free, and some of it has been acted upon by complement either alone or through the action of some intermediary substance. This changed protein, partially digested if you wish, is capable of producing sensitiveness in tuberculous animals. Tuberculin probably undergoes similar changes. It is easy to conceive of the whole process of tuberculin immunization as a method of stimulation of parenteral digestion. The cells of the normal body are incapable of digesting tuberculin, but the cells of tuberculous animals have acquired what might be termed specific digestive power, but unfortunately possess it in such a limited extent that the products are not end-products and are poisonous to the tuberculous animal. The object of tuberculin treatment from this point of view is the development of intracellular digestion to such an extent that the intermediate products are passed over and the end-products are harmless to the tuberculous animal. These substances, whatever they may be termed, have not yet been causally connected with clinical improvement or, indeed, with sensitiveness to tuberculin.

These theoretical considerations might be pursued further, even with some advantage, were the time at our disposal.

To turn to the practical therapeutic administration of tuberculin. I might repeat what I said before this Association six years ago, namely, that the most important point in the tuberculin treatment is the dosage. At that time I predicted that the opsonic index would never be generally adopted as a guide to the individual dose. Since that time the cutaneous and ophthalmic tests have been widely employed, and some have made use of them in determining the individual dose, as we shall hear a little later from Dr. White.

Many sites of administration of tuberculin have been employed, such as the oral, rectal, vaginal, intratracheal, intravenous, cutaneous, intracutaneous, subcutaneous, and the inhalation methods. For one reason or another the majority of these have been discarded and tuberculin is now usually injected under or into the skin. The intravenous method has some possibilities, but Koch and his followers who made use of it were never very enthusiastic about it and few have employed it.

PREPARATIONS FOR ADMINISTRATION

How long tuberculin retains its strength in solution has never been determined. Strong solutions (7½ per cent.) appear to lose much of their reacting power at the end of two to three years. Weaker solutions may deteriorate more quickly, and I have used dilutions, freshly prepared, every two weeks. As a diluent, ¼ per cent. phenol in physiological saline has been used, but the phenol can be replaced by lysol. A 10 c.c. cylindrical graduate, an ordinary tuberculin syringe, and a bottle of sterile physiological salt solution, preferably with a siphon or a stop-cock inserted at the side, enable one to make the dilutions in a very few minutes. Each dilution is $\frac{1}{10}$ the strength of the preceding.

The skin should be rubbed with alcohol and the needles sharpened each day before use. A very fine needle should be used.

VARIETIES OF TUBERCULIN

The forms of tuberculin which I have used might be grouped under three heads:

First. Those forms of tuberculin which consist of extracts of tubercle bacilli or substances secreted during their growth, if such exist. Koch's original tuberculin is the best example of this class. Among other forms I

have used Landmann's tuberculol, Denys' broth filtrate, Beraneck's tuberculin, tuberculin A.F., Gabrilowitch's endotin.

Second. Tuberculin composed of the body substance of the tubercle bacillus, of which I have used T.R. and B.E.

Third. I believe I was the first to suggest the use of these two types of tuberculin together. A compound known as B.F.Co. consists really of a mixture of broth filtrate and bacillary emulsion in the proportion of 5 to 2 by volume. This form of tuberculin contains every product of the tubercle bacillus, unaltered by heat, and theoretically appeals to me very much.

Practically, I might say that I have not noticed any difference in the action of the various types of tuberculin save that some are more poisonous than others.

DOSAGE

When I first began to give tuberculin in 1900 I used the doses advocated by the makers of the various tuberculins which I employed. Accordingly for O.T. the first dose was 0.1 mg., for T.R., 0.002 mg., and for B.E., 0.0025 mg. solid substance. Later it seemed to me that when much smaller beginning doses ($\frac{8}{1}$ or even $\frac{9}{1}$) * were employed, the patients reacted to much smaller quantities of tuberculin. Anaphylaxis had not been described at that time, but certainly many patients seemed to exhibit marked susceptibility to very minute doses. More recently I have again employed larger beginning doses and frequently give 0.000001 or even 0.00001. These doses cause no reaction in many patients, but a few become hypersensitive and I am never able to increase the dose very much.

METHODS OF ADMINISTRATION

There are two methods of giving tuberculin which have different aims in view. The usual method, that described by Koch and modified by Trudeau and others, is to give a dose much below that required to produce a reaction and by gradually increasing the quantity to bring about immunity or better tolerance, not to the tubercle bacillus but to tuberculin itself. I have employed this method for years, but always realized that it fell far short of what was required for the most successful treatment. When the discovery of opsonins was announced, I hoped that the opsonic index would give us the criterion that we needed to select at each injection the optimum dose. It is needless for me to say that the method presents too many difficulties, too many uncertainties, to enable it to be employed for such purposes. In

* This represents 0.000000001 and 0.0000000001 c.c.

many patients it is not difficult to bring about a marked tolerance to most tuberculin, and there is some evidence to show that patients who take tuberculin well have a tolerance to it which may have been established before tuberculin treatment has been begun. One patient recently received as an initial dose 0.00001 B.F. and in 114 days was given 33 doses, the last being 1000 mg. of B.F., without suffering a reaction or inconvenience at any time. The patient did very well, but was it on account of tuberculin? I question it. Others started about the same time have never been able to take a dose as large as this. They have not done so well.

Where tuberculin tolerance is wished, it seems to me safe to give, say, $\frac{8}{1}$ O.T. in 0.1 c.c. of diluent, intradermically, and to increase the dose tenfold twice a week ($\frac{7}{1}$, $\frac{6}{1}$, $\frac{5}{1}$, $\frac{4}{1}$) until the local skin reaction begins to be marked. In one case with extensive physical signs and good general condition and few symptoms, I reached a subcutaneous dose of $\frac{3}{1}$ O.T. in six to seven weeks with only fairly marked intradermic reactions. Such a patient has a large number of highly sensitized areas in his skin which may possibly throw off antibodies into the blood. The beginning dose may in most cases be much higher without fear of reaction. Such a method would quickly lead to doses that cause response in the organism and so bring about the formation of antibodies which occur more often with large than with small doses.

The rate of increase of the dose early interested me, as I found that when I increased the dose by tenths of a cubic centimeter of the various dilutions (each of which is always ten times the strength of the preceding), I frequently got reactions when I increased from 1 to 2 or from 2 to 3 tenths. This led me to interpolate 1½ and 2½ tenths and to drop out 7 and 9. Later, with the aid of the late Mr. Pope, I constructed a logarithmic scale

DOSES (LOGARITHMIC SCALE) IN HUNDREDTHS OF A CUBIC CENTIMETER

2	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
.32	.22	.18	.16	.15	.14	.13	.13	.13	.12	.12
1.	.47	.32	.25	.22	.2	.18	.17	.16	.15	.15
	1.	.56	.4	.32	.27	.24	.22	.2	.18	.18
		1.	.63	.47	.37	.32	.28	.25	.23	.22
			1.	.68	.52	.42	.36	.32	.29	.26
				1.	.72	.56	.47	.40	.35	.32
					1.	.75	.60	.50	.43	.38
						1.	.77	.63	.53	.47
							1.	.80	.66	.56
								1.	.80	.68
									1.	.83
										1.

in which the increase was by geometrical proportion. This was based upon Fechner and Weber's law, namely: to increase the reaction in arithmetical proportion it is necessary to increase the stimulus in geometrical proportion. This table enables me to increase from 0.01 to 1 c.c. of any dilution, using any rate of increase that I wish to select from 300 per cent. down to 12 per cent. I usually employ a rate of increase of 50 per cent. and find reactions no more likely to occur at one point of the scale than another.

The intervals are usually three or four days for the smaller doses and seven days for the larger doses.

The second method of giving tuberculin depends upon repeating the same dose at much longer intervals. Wright was the first to suggest such a method of treatment. I confess that I have never used the opsonic-index method, for it appeared to me from the start as impracticable. Good results have been reported by this method, but Wright early stated that auto-inoculation was so frequent and so easily produced in pulmonary tuberculosis that his method was of little avail. On the other hand, Kinghorn and Twichell showed that when an attempt was made to attain tuberculin tolerance, irrespective of the opsonic index, and the dose given in either the negative or the positive phase, the results were about the same. The opsonic index, they concluded, could be disregarded when tuberculin tolerance was aimed at. Many of us who have given tuberculin have, from time to time, received accidental inoculations which resulted in severe reactions. After recovering from such a reaction many experience a pronounced feeling of well-being, which is so marked in some patients after the tuberculin test that they have requested me to give them the tuberculin treatment. Such facts led W. C. White to attempt to estimate for each patient the dose of tuberculin that will just fall short of a fairly marked reaction. He makes use of the cutaneous test and applies a definite quantity of tuberculin to an abrasion, made so deep that the pink of the corium can be seen without producing any exudation of serum or blood. He then covers the tuberculin with a vaccination shield and allows it to dry *in situ*. When the cutaneous reaction at the end of the forty-eight hours has not exceeded 5 mm., he calls it the desired reaction and proceeds to give this dose, not subcutaneously but in the lower layers of the skin, where it causes a local or "Stichreaktion" of 20 to 40 mm. in diameter. If given oftener than every two weeks, he believes the patient acquires tolerance for tuberculin, and so his interval is two weeks. I cannot subscribe to all the details of this method, but in certain cases it is of apparent usefulness.

I shall not attempt today to go into any details about increasing the

dose when tuberculin tolerance is the aim. A good general rule is never to increase the dose when there has been any pronounced deviation from the usual trend of the disease. Another rule is, when in doubt about giving an increased dose, do not do so. A very curious thing is that when tuberculin helps a patient very much, small doses appear to have as beneficial effects, certainly upon the symptoms, as larger. Tuberculin treatment, whatever working hypothesis is adopted, must be looked upon as a method of active immunization. Since this is the fact, it is useless to expect body cells, already flagging, to react with an adequate response. At such periods tuberculin treatment should be omitted.

THE RESULTS

The goal of treatment in every patient is the cure of his disease or the alleviation of his symptoms. The estimation of the results of such treatment, however, is not always easy, for in many instances at least two personal equations enter, that of the patient and that of the physician. I am convinced that the explanation of the excellent results reported, *e. g.*, in pulmonary tuberculosis, by the use of such substances as urea, sanosin, lignosulphite, griserin, nucleic acid, hetol, etc., are due far less to the action of the drug *per se* than to the effect of suggestion on the patient, perhaps unconsciously exerted, through the faith of the physicians who have first employed them. Certainly most of them when given, as it were, "in cold blood," produce such poor results that their use has been largely discontinued. Now, tuberculin cannot escape this weakness and, indeed, I believe its value can be greatly enhanced when the administrator has implicit faith in its curative properties and imparts that faith to his patients. The scientific physician of today who keeps faith with himself and refuses in such a chronic and relapsing disease as pulmonary tuberculosis to promise a "cure" to any patient by the use of any means, will certainly divest that means of a certain amount of suggestion and may rob it of some results that an absolute belief could impart to it. Such a believer, however, can get no idea how much of the results are due, for example, to tuberculin and how much to the faith he has imparted to his patients. However, I am not here to discuss suggestion or auto-suggestion, but the effect of tuberculin. I might say that the only suggestion I employ in connection with tuberculin is auto-suggestion by the patient. I try to be frank with him and tell him at the outset that tuberculin may help him and will not harm him if properly given, for of this I feel sure. One of my friends, whose faith in tuberculin is such that he can, I believe, honestly promise his patients that he will

cure them with it, should get far better results than I, though he has never as yet collected his results.

Another factor which must be taken into account in discussing results of tuberculin treatment is the closer relationship that such treatment establishes between patient and physician. I must confess that I find it difficult to bring a patient to my office twice a week for months and discuss symptoms and fears, one of which gradually grows less while the other is often replaced by more or less indifference, born of familiarity. When, however, I give this patient tuberculin, he and I can discuss his case in detail twice a week and I am able to discover slight but important changes in his condition, to check imprudence, and to change needless timidity into confidence in his ability to order aright his life. I cannot but believe that such a patient has a very great advantage over another who takes no such treatment. These factors must be taken into account in any treatment, and I am convinced affect materially the results.

THE EFFECT UPON SYMPTOMS

The symptomatic effect of tuberculin demands careful study and observation during treatment. Much work has been done upon the blood. It was early stated that tubercle bacilli were mobilized and occurred in the blood during the tuberculin reaction, but trustworthy evidence has never been produced that such is the case. The leukocytes show an essential increase, rarely over 10,000 per cubic millimeter, and Arneth's neutrophilic picture may be shifted to the right and so approach nearer normal. In some instances, especially after large doses, agglutinins, precipitins, opsonins, and complement deviating substances occur in the serum. The urine may show a diazo-reaction at the height of a general tuberculin reaction, but does not do so otherwise. Some believe the quantity of urine is increased. The weight may decrease slightly after large doses and especially after reactions, but when the course is finished the weight often increases rapidly. The appetite is usually unaffected except with reaction, but may be improved. The strength is quickly affected when the doses are too large. A feeling of discomfort, of ill-being, even malaise may occur without rise of temperature. They indicate tuberculin poisoning and must be avoided. When the temperature varies from 99° to 100° following each dose, it may be lowered or fall to normal. In other patients a slight temperature of 99.5° becomes normal and remains so, but in a few rises again when treatment is stopped. Rise of temperature may not occur until the patient is

severely poisoned with tuberculin and must not be considered the sole guide to dosage.

The localizing symptoms may be increased or diminished according to the effect of the dose. The cough and expectoration may be lessened with each dose in such a way that the patient calls attention to it. Such a dose should always be repeated as long as such favorable results are obtained. In others the cough and expectoration increase with each dose and the treatment has to be abandoned. Usually there is no effect noticeable one way or the other. The virulence and morphology of the tubercle bacillus are apparently unaffected, but more patients taking tuberculin seem to lose their bacilli. This is especially true for the moderately advanced patients. Oppression in the chest is not uncommon, while pleurisy can rarely be attributed to tuberculin.

The physical signs may be increased, but it is more often difficult to detect during treatment any change in the physical signs other than what usually occurs from day to day in most patients.

My experience leads me to believe complications occur less frequently among patients receiving tuberculin treatment, but it does not exclude their occurrence.

THE UNTOWARD RESULTS

Tuberculin, like arsenic or strychnin, is a powerful poison, which, when used injudiciously, is capable of great harm. The disrepute into which tuberculin fell at first was due to the selection of patients who should never have received it and to faulty dosage and too short intervals. Coincidence undoubtedly accounts in part for some of the so-called "unfortunate results." The mobilization of tubercle bacilli in the body, claimed by some to occur after tuberculin, has never been proved to occur either clinically or experimentally. In over 10,000 injections, 11 instances of hemoptysis more or less closely connected with or at least following tuberculin (in one to three days) have come under the writer's notice. In none was it severe, in most slight, and in eight a previous hemoptysis had occurred. I have given, together with my assistants, to some 200 to 300 patients from 10,000 to 20,000 injections, and have observed but two unhappy results at the site of inoculation. In one a patient received too large a dose of bacillary emulsion at a single point and developed a sterile abscess which was healed by aspiration without opening. The second patient had what seemed to me to be a neuritis, as there was little to be seen at the site of inoculation. It was exceedingly painful and prostrating, and deterred me for many years

from injecting tuberculin into the arm. I might add that I now nearly always give it in the arm.

I have seen patients taking tuberculin do badly, and have seen complications arise which might be attributed to it. I have also seen the same complications occur in patients to whom we had thought of giving tuberculin. While I have tried to keep an open mind in regard to tuberculin, Imay be, somewhat prejudiced in its favor, though many of my colleagues in Saranac Lake would more readily believe the opposite. Consequently, when I say I have never seen any permanent untoward results to be attributed directly to tuberculin, I hope you will believe that I have tried to be fair.

There is some evidence, both experimental and clinical, to show that tuberculin may cause nephritis, or at least that it develops during treatment.

EXPERIMENTAL RESULTS

The results of treatment of tuberculous animals with tuberculin have not been satisfactory. Life has been prolonged and changes have occurred in the lesions which demonstrate an attempt at healing, but cure or bacterial immunity has not been effected. Some deny the value of animal experimentation in regard to tuberculin in man, and much slipshod work has been published. Today the value of tuberculin treatment for man rests solely upon the results obtained in man.

ULTIMATE RESULTS

The results in man have been for the most part good, but many observers have failed to support their contentions with proof other than their personal belief or impressions.

Selection of patients certainly affects the results, and when only favorable cases with tubercle bacilli in the sputum are chosen, the results will be far better than when all patients are given the treatment. At the Adirondack Cottage Sanitarium we gave tuberculin to carefully selected patients for a time and then selected for a year or two the worst cases. Later we exercised no selection but allowed the patients to elect to take tuberculin treatment. We thought this would be the fairest test, but in reality it has resulted in a selection against tuberculin, as those patients who wished to stay a little longer because they were more advanced or ran a subacute course chose to take tuberculin. The patients we selected because they were the worst did remarkably well. The results, on the whole, when reduced to cold figures, with every error we could think of eliminated, showed that among the moderately advanced patients those who took tuberculin did

better than those who did not, while for the incipient stage the difference was less pronounced. This held true for both immediate and ultimate results.

In the individual case, however, tuberculin often falls far short of what is hoped from its use. In early cases it is almost impossible to say how much good tuberculin does. In the more advanced cases favorable results are more often seen, and in the very chronic cases the effect of tuberculin is, in a few, truly astonishing; so good, in fact, that no one questions it. It is these results that win for tuberculin its advocates, and I am sure that after two or three such cases few would doubt its efficacy in some patients. When, however, results are tabulated and impartial statistical methods applied, they are so far from upholding the impressions created by these few cases that the statistical methods themselves, and not the results of tuberculin, are questioned.

My observation leads me to believe that incipient cases treated with tuberculin do somewhat better than those not so treated, while the moderately advanced cases do much better. The ultimate results do not show such marked differences, but indicate that the treated, both incipient and moderately advanced, do better.

THE VALUE OF REACTIONS IN TUBERCULIN THERAPY*

By William Charles White, M.D., and K. H. Van Norman, M.B.
Pittsburgh

Notwithstanding the universal use of tuberculin for the past five years, opinion as to its value as a therapeutic agent is as divided as ever. The number of tuberculins has increased, the methods of administration have altered, the dosage has changed, and still we have nothing offered but impressions,—on the one hand, of those who favor it, and on the other hand, of those who discredit it,—and, in the last analysis, very little positive proof one way or the other.

When we consider how many factors enter into the tuberculin reaction from the standpoint of administrator and clinical examiner, from the standpoint of the patient, and from the composition of the tuberculin, it is small wonder that we are still at sea. Indeed, one is reminded in the progress of tuberculin therapy of the difficulties attending the attempt to apply the Mendelian principle to human attributes after finding that it was applicable to grains or the color of mice.

The faults and weaknesses at the door of the administrator are probably the most easily controlled, for it is possible for the administrator to leave the paths of old therapy,—as exemplified in the teaspoonful of quinin,—and to utilize a definite quantitative basis of administration. Even this is difficult, however, for a small percentage of doctors have habits of great exactness. The personal factor enters largely again into the examiner's determination of the extent of the lesion and the classification of disease, so that it becomes impossible to compare any group of one examiner who gives tuberculin with that of another who does not give tuberculin, or even two groups assembled by one man, to one of which groups he administers tuberculin and to the other of which he does not give tuberculin.

The patient is probably the one more or less constant factor and varies

*From the King Edward VII Memorial Laboratory of the Tuberculosis League of Pittsburgh, with funds supplied by Mr. R. B. Mellon.

little from time to time in his response to tuberculin poison, but the subjective symptoms of the patient are as variable as the patient, and one need but see the list of questions of many clinicians to see the futility of such a basis for classification.

Tuberculin varies greatly in its potency, a fact which is very striking to those who are constantly using the output of one manufacturer. This is not to be wondered at when one sees the variability with which tubercle organisms grow on artificial media and considers the consequent variation in amount of the material dissolved by maceration in the media or generated by the organisms. We, with many others, have felt the necessity for years of standardization of tuberculin on some basis which will allow uniformity. Last year we attempted some work in this line on the basis, first, of its nitrogen content, and a later determination of its value on a basis of skin sensitiveness of the commercial product, but we are unable to make any report on this owing to failure in carrying out the Kjeldahl test. We hope still to be able to accomplish this standardization, which seems a very rational one.

The above possibilities of error render any conclusion from therapeutic use of tuberculin very unsatisfactory, and impressions are as elusive as the results to be obtained in any other field of impressionistic work. In our investigations in the past three years we have used Koch's old tuberculin (human), and the observations in this paper deal with this tuberculin.

The main symptoms (so called) of beneficial results of tuberculin are usually described as decrease of cough and sputum. This is apparent in more than 50 per cent. of our cases, but it is not constant in any one individual case nor is it constant enough with all to be used as any proof. Our results in the past three years show that 50 to 65 per cent. of our cases have diminution of cough and sputum following administration of tuberculin, whereas the remainder have either no change or an increase of sputum for a few days. One feels diffident, therefore, in using this fact in this discussion because the usual history of tuberculosis with a favorable outlook is decrease of cough and sputum. We have, however, been struck with the increased resistance of the patient, as shown by diminished tiredness and by a feeling of ability to do things. This symptom has been practically constant in our patients in the past three years.

Prior to three years ago we administered tuberculin in the usual way of small doses gradually increased. There has been no appreciable change in the classification of cases coming under our supervision, the hygienic conditions have been the same, and the strict medical supervision has not changed.

Yet, prior to three years ago, we were unable to note this feeling of well-being in our patients, although it was looked for in the routine way. The patients usually stated that the tuberculin made no difference in their general feelings, and this is in rather decided contrast to the condition of things since then. Most of our patients look forward to tuberculin day to receive the stimulation to carry them through another fortnight. Naturally, we have very often suspected neurasthenia, but have almost always proved the fallacy of this by giving them injections of sterile water or very small doses of tuberculin and the difference was noticed by the patients. We would not consider this an argument were it not that it has been prominent in patients who have been sick for many years and in whom, with the increased feeling of well-being, there was no marked change of lung signs, cough, and sputum between the pre-tuberculin and tuberculin periods. This feeling of increased resistance is most marked in those patients who are working under medical supervision, and these patients have noted how much less easily they tire from work after taking tuberculin. In about 5 to 10 per cent. there is a feeling of lassitude for two or three days following the administration of tuberculin, but at the end of this lassitude the patient feels improving strength and well-being for ten to twelve days. We are led to believe that it is the reaction of tuberculin which produces this increased resistance. This conclusion is arrived at from our observations of hospital cases during the past three years and also from the history of a certain number of patients who have had tuberculin before coming under our supervision. Many of these patients have had one or two or even more slight constitutional reactions from tuberculin and have nearly all felt much better for weeks after the constitutional symptoms had abated.

We have under supervision at present two patients who for exactly three years have been given tuberculin in doses to cause local reaction at the point of injection. This is the longest period of time in our experience of constant tuberculin therapy with local reaction following each administration. Both these patients have had active pulmonary tuberculosis for ten or twelve years. For five years prior to coming under our supervision, these cases had been given tuberculin in small doses gradually increased, and had run the gamut of most of the tuberculins on the market in the hands of five or six competent physicians (by which we mean physicians who were experts in tuberculosis). When coming under our supervision they were able to do one or two hours' light work daily, but not more. For three years they have had local reactions from tuberculin every two weeks, and at present are working eight to twelve hours daily at heavy work.

The purpose of this paper is not primarily to argue whether or not tuberculin is of any benefit in the treatment of tuberculosis. As originally stated, there is little proof either way, but we feel that if tuberculin is to be administered, it should be given in doses which cause local reaction at the point of injection. The only real proof of the value of tuberculin along these lines has been shown by the work of Trudeau with rabbits' eyes (Reference 1), and Saathoff (Reference 2) with the similarity of the reactions of his ocular tuberculosis with local reactions of tuberculin. Additional proof appears in the evidences in surgical tuberculosis, showing the similarity of reaction in gland and bone to the reaction at the site of the injection of tuberculin. It also appears in certain lupus cases in which improvement followed the reaction around the lupus herd, which reaction bore a certain relation to the local reaction at the site of injection of the tuberculin. It will be seen that all the positive evidence of the value of tuberculin lies in the suggestion for the necessity of reaction around the tuberculous herd. The only positive proof that reaction around the herd at all agrees with the reaction at the site of injection has come from visible tuberculosis, such as tuberculosis of the eye, larynx, glands, and in lupus. There is no positive evidence that any such reaction of benefit results from small doses, but to get results the dosage of tuberculin must be such as to cause local and focal reactions. If, then, one is to give tuberculin, it would seem best to give it in such doses as to cause reaction at the point of injection. The dose to produce this result varies in each individual case, and to save time in the patient's cure we have devised a means of determining the dosage from the skin sensitiveness. This method we have already reported two years ago at the National Association for the Study and Prevention of Tuberculosis and in the Archives of Internal Medicine, January, 1912.

The method outlined in our former paper was first to determine the sensitiveness of the individual to tuberculin by using on the skin a definite quantity of varying dilutions of tuberculin; then, having arrived at the dilution which, with a given technic, would give a minimal cutaneous reaction around the point of scarification, to determine on this basis the quantity of tuberculin which could be given subcutaneously to produce a reaction of required degree. The given technic just mentioned consists of a modified von Pirquet test, in which scarification is made before tuberculin is applied to the skin.

The basis of our investigation was that the sensitiveness of the skin cells to tuberculin indicated the sensitiveness of all body cells, and the point to be attained was the ratio of the amount of tuberculin producing a certain

grade of reaction when placed *on* the skin and when injected *under* the skin. This is determined as follows:

In all skin tests $\frac{1}{100}$ c.c. of the solution of tuberculin is used. As 1 c.c. of pure O.T. contains 1000 mgm. of tuberculin, we can easily determine the amount of tuberculin placed on the skin in all cases; as $\frac{1}{100}$ c.c. of pure O.T. equals 10 mgm., $\frac{1}{100}$ c.c. of a 10 per cent. O.T. equals 1 mgm., and so on.

Definite solutions of tuberculin are used, and each patient is tested until we find the solution of tuberculin, $\frac{1}{100}$ c.c. of which when applied as a skin test will produce a reaction,—redness and some induration,—measuring exactly 4 mm. in diameter, within seventy-two hours. Such a reaction we call a Min. Cut. reaction.

This standard is arbitrary on our part and was arrived at after giving many hundred skin tests. As an example, let us suppose we apply $\frac{1}{100}$ c.c. of a 1 per cent. solution O.T. as a skin test, and that this amount of the 1 per cent. solution produces an M. C. R. in seventy-two hours. As $\frac{1}{100}$ c.c. of 1 per cent. O.T. contains $\frac{1}{10}$ mgm., then we have applied in this test $\frac{1}{10}$ mgm. to produce an M. C. R.

The next point was to determine the ratio between this amount of tuberculin on the skin and the same or other amounts under the skin, and this ratio is as follows:

The quantity of tuberculin contained in 0.01 c.c. of that definite solution of tuberculin which will produce exactly the minimal cutaneous reaction which we call 4 mm. in redness and induration at the site of application of the test, will produce, when given subcutaneously, an area of redness, tenderness, and swelling measuring 2 to 5 cm. in diameter. In other words, we could produce at will a certain grade of local reaction with no constitutional disturbance.

By this method it is possible to determine a dose of tuberculin for each case which will produce exactly the same degree of local reaction in all individuals. It will allow the determination of a perfectly safe dose varying at least 200 times in quantity. During the past three years we have determined that in tuberculin dosage there is, in individuals, a variation of a primary dose from at least $\frac{1}{400}$ to $\frac{1}{2}$ mgm. of tuberculin to produce the same amount of local reaction.

We have shown, therefore, in this method that we can positively determine the amount of tuberculin which will produce a certain grade of reaction. All the positive evidence that has been adduced is that reaction is a valuable thing in tuberculin therapy. Consequently, we feel that if tuber-

culin is to be administered at all, it should be given in a way which will determine the individual dosage with a degree of reaction, in some way similar to or better than ours, even if only from the standpoint of saving time in tuberculin therapy.

One of the most striking things in watching the reaction of tuberculin is the length of time for which certain patients show constant response of the same degree of reaction to the same dose of tuberculin. Another point is the nearness to which we can approach the dose which will produce constitutional reaction, and the third point is the gradual fading of reaction as the patients get well.

It is interesting to note that one of the later publications on tuberculin therapy is in favor of the administration of tuberculin in doses to cause local reaction, and the writer of this later publication (Reference 3) feels that without local reaction tuberculin therapy is of little if any value.

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THE USE OF THE TUBERCULIN TEST (SUBCUTANEOUS)

By W. L. Dunn, M.D.
Asheville, N. C.

(Read by Title)

Despite the well-demonstrated fact that the successful treatment of pulmonary tuberculosis depends upon early diagnosis, and that for the best results the disease must be diagnosed in the closed stage, and although case histories show that a large share of the open cases have given abundant opportunity for diagnosis when still closed, and notwithstanding the mass of literature declaring the properly safeguarded tuberculin test to be without harm, diagnoses of the disease in the closed stage continue to be rare exceptions.

While the treatment of the tuberculous may possibly be within the field of the specialist, the diagnosis, and more particularly the early diagnosis, lies peculiarly in the province of the family physician. Although the specialist, because of his opportunities and of his rich experience, is best fitted to make a diagnosis by physical methods and least often needs the confirmation of the tuberculin test, he uses it most frequently. On the other hand, the general practitioner, who, in the nature of things, and because of his diversified work, cannot reasonably be expected to recognize and interpret the more delicate changes in incipient tuberculosis, depends almost exclusively upon his untrained ear and rarely resorts to the tuberculin test for the confirmation or removal of his suspicions.

If all that has been written of the reliability of the test and of its harmlessness is true, it is hard to understand why the one who has the least opportunity to make early diagnoses and who is best fitted to make them without the tuberculin test most frequently resorts to its use, and the other, who has the greatest opportunity to see cases early and who is least fitted to make a diagnosis by physical methods, resorts so little to the use of this test and continues to take the most difficult method of making a diagnosis, and because of his inability to detect the significant signs, or because of their

absence, waits for the development of the grosser lesions which he can recognize and for the appearance of tubercle bacilli in the sputum.

While we may not have the highest respect for life-insurance examinations, it must be admitted that the carefulness with which these are made compares very favorably with that of the average office or bedside examination. A glance at the accurately compiled statistics of insurance companies shows a very high percentage of deaths already during the first year, and still more during the second and third years. With our knowledge of the nature of the disease it is almost certain that practically all those cases dying during the first year had foci of the disease in their lungs at the time of the examination, and it is exceedingly probable that the majority of those dying during the second and third years were tuberculous when accepted. It must, of course, be remembered that these accepted applicants give no history of recent exposure and do not give suspicious symptoms, for they would otherwise not be accepted.

A good evidence of life-insurance companies' lack of faith in our ability to recognize, unaided, the signs of early tuberculosis is that the history of a recent exposure in the family is sufficient cause for rejection of the applicant for life insurance. This, to my mind, is not so much a reflection upon us as an evidence of the practical limitations of physical methods alone to detect the finer changes of early tuberculous involvement of the lungs. Whether life-insurance examinations are well made or not, this opinion is supported by the relative infrequency with which patients in the closed stage of tuberculosis are placed under treatment by the family physician or referred to the specialist. However much we may dislike to admit either our inability or our unwillingness to go to the trouble of making examinations sufficiently thorough to make, with any degree of certainty, either positive or negative diagnosis of early tuberculosis, it is not a theory, but a sad condition, with which we are confronted. And if we may hope to make any really serious improvement in our results or advance toward the eradication of the disease by treatment, it is a condition that must be corrected.

I am quite willing to acknowledge that the specially skilled physical diagnostician is usually able to recognize and interpret the delicate changes which indicate early tuberculous involvement. At the same time we must remember that the development of the specialist's skill has been at the cost of much time and concentrated effort, and has required special opportunities of observation and study not open to the general practitioner. We must not forget that the patient is willing to give the specialist almost unlimited time in which to make a diagnosis and express an opinion, and is then quite

willing to remunerate him accordingly. I am not unmindful of the importance of the history and symptoms in making a diagnosis, but so long as loss of weight, cough, evening temperature rise, etc., can be attributed to other causes, in the absence of physical signs which he can recognize, the average doctor is going to make a diagnosis of incipient pulmonary tuberculosis last, and then with so many reservations as to make the diagnosis worthless as an earnest incentive for the patient to live the necessary life to get well. If we must depend upon physical methods and symptoms to make diagnoses of closed pulmonary tuberculosis, we must either train the whole profession to become tuberculosis specialists or be content to see the vast majority of the tuberculous lose their chances of obtaining satisfactory results.

When the tuberculin test furnishes a reliable and easy means of diagnosis, we must seek for some reason why it is not more generally used. I cannot convince myself that the old-time fear of tuberculin plays any very important rôle today. There seems to be some sort of mysticism surrounding the procedure, an idea that it is a most complicated and difficult thing to do; that it requires special technic, and that it is time consuming. In fact, I think that this impression is more or less justified from the standpoint of the man untrained in modern laboratory technic and bacteriologic methods. Imagine yourself a busy country doctor without laboratory training, unfamiliar with the metric system of weights and measures, and only a reading acquaintance with cultures and incubators; then pick up almost any description of the tuberculin test, which nine times out of ten will begin with a history of the discovery of the tubercle bacillus by Koch, carry you through the ups and downs of the first tuberculin era, recall Virchow's observations and warnings, and finally reach a discussion of the preparation; then will follow a most unnecessarily complicated description of the technic, bristling with pipets, milligrams, cubic centimeters, fractional per cent. solutions of carbolic acid, or possibly of orthokresol, boiled pipets preserved in 5 per cent. carbolic and washed in sterilized water, boiled hypodermics graduated in a strange system, preparation of the patient as for a major operation—all of this only precedes the application of the test, which will consume from five days to three weeks for its completion. Is there any wonder, then, that the general practitioner, in his search for aid, has tried the samples of Morro's ointment dealt out to him, or has become confused and has arrived at palpably false conclusions by the use of the simpler von Pirquet test in adults instead of limiting it to children, where it is so useful? I am convinced that it is in this that we have the explanation of why the test is not used on the

scale that its reliability, its freedom from danger, and its ease of application would warrant, and that the urgent need of early diagnosis demands.

The technic should be freed from every unnecessary step and simplified in every particular, and the description written in every-day language, and, above all, the time consumed for the completion of the test made as short as possible. Wherein can the description be simplified?

Instead of the elaborate methods of dilutions, tell the doctor to get from the manufacturer a 1:100 or a 1:1000 dilution of old tuberculin and tell him how many minims to inject hypodermically. Or, if you must tell him how to make dilutions for himself, don't forget that tuberculin is cheap, a cubic centimeter costing only a quarter; tell him to make a 1:1000 solution by taking 5 minims and diluting it up with 10 ounces of 1:200 carbolic acid solution in measures or bottles which have been thoroughly cleansed and rinsed with 5 per cent. carbolic acid, or just as well with clean boiled water; to inject so many minims and throw the rest away, because it won't keep more than a week. If you must give the dosage in milligrams, say simply that 15 minims of a 1:1000 solution will contain a milligram, or that 15 minims of a 1:100 solution contain 10 milligrams. Cut out all the boiling and cooking—it's wholly unnecessary. The elaborate preparation of the skin is uncalled for. There is no more need for care in preparation of instruments and skin than with an ordinary hypodermic injection of strychnin—indeed, not so much, since the tuberculin is diluted with 1:200 carbolic acid, which is ample protection against infection. I have given or had given hundreds of thousands of injections of tuberculin with no preparation of the skin and without a single hypodermic abscess. Again, it is much more readily understood and simpler to say 1:200 carbolic than 0.5 per cent. solution.

Tell the physician that he must have exhausted every other ordinary means to arrive at a diagnosis before undertaking the tuberculin test; that any sputum must have been examined for tubercle bacilli, and that, if found, the test should not be made, not because it would injure the patient, but because it is wholly unnecessary and would inconvenience the patient and make him uncomfortable without reason. Mention briefly the list of contraindications. Explain the importance of a two- or three-hourly record of temperature for two or three days before and after its injection.

Now about the dosage. I am very much inclined to believe that Evans, of Chicago, was wholly right when he advocated the use of a single large dose. This everlasting taking of temperature for weeks and keeping patient and family keyed up to a high pitch when it becomes necessary to give a second, third, or fourth dose is a very serious objection to the general use of

the test. In my own experience, more than two-thirds of cases will react to 2 mgm. or less, and I do not think that within certain limits the size of a dose has very much to do with the severity of the reaction. Personally, I think that it would be quite safe to advocate a single dose of 2 or 3 mgm., or, if such a dose was not distinctly positive or negative, after five days a second dose of 5 mgm. might be given. And I might add that it would be usually quite as safe to depend upon the patient's subjective symptoms as upon the temperature record as it would be made by the average layman unaccustomed to reading a clinical thermometer.

I am quite aware of the objections which might be raised to this method of dosage, but if such simplifications would lead to a more general use of the test, the possible occasional danger of severe reactions would sink into insignificance when compared with the enormous good which would result from the detection of so many cases in "the curable stage." Of course, a small number would fail to react to the selected dose, but better that a few escape detection than that all should do so.

It would also be wise to eliminate all superfluous theoretic or scientific discussion of the various modifications of the test, making the very simple and straightforward statement that the Morro test is of doubtful value, even in children; that the von Pirquet test in early childhood is reliable, but that nearly all adults react to it; that the conjunctival test should be used only in those cases in which high or irregular temperatures and contraindications to the hypodermic tuberculin test exclude its use, stating plainly and unconditionally that even then it should not be used if any inflammatory disease of the eye has recently been present, and that it should not be used more than once in the same eye because it is dangerous.

Another thing of great importance to correct is the tendency to interpret the local reaction as a positive reaction—in my experience, this must be interpreted in exactly the same way as a positive von Pirquet—in young children it is significant, in adults it means nothing.

Today the test is used very little outside of those cases in which there are suspicious symptoms which cannot be confirmed by physical examination. But with its more general adoption it could be extended to a much larger class of cases—for instance, to those who apply for indefinite complaints not suggestive of tuberculosis, where the physician knows of a dangerous exposure to infection in family or workshop.

If the family physician were to test all the well members of the family of his tuberculous patient, or to advocate the testing of the man who looks to him for advice when he happens to know if he has been exposed in office or

workshop, or if, when the doctor discovered a case that had dangerously exposed others, he would advise them to go to their own physician to be tested, early diagnoses would soon become the rule, patients would get well, and foci for spread of infection would be materially diminished.

It has been deemed impractical for life-insurance companies to make use of the test. It has been suggested that instead of rejecting an applicant on the sole ground of a recent exposure in his family the acceptance of his application be made conditional upon his subjecting himself to a tuberculin test. This would serve a double purpose: it would make it possible for many to secure life insurance, and it would be responsible for a successful fight against a beginning and unsuspected disease in many others.

Many other ways and places in which the test could be used suggest themselves, but let us consider for a moment some of the objections which could be made to such general use. The possibility of harm from severe reactions has been so generally denied that it might be passed over. Although I am quite willing to advocate a single large dose, I personally do not believe the tuberculin reaction is always free from harm, but that its danger is so small and so rare that it is negligible when compared with the good of early diagnosis. There certainly can be no harm to non-tuberculous.

It may be objected that some of those reacting would never have become clinically tuberculous. That is quite possible in light of the postmortem findings reported by Nägeli and others, but it is also true that the taking of precautions because of the diagnosis would be responsible for many others remaining well who would have otherwise undoubtedly become frankly tuberculous.

But what does all this amount to when compared with the good resulting from the recognition of thousands in "the curable stage," the reduction of so many foci for spread of infection, the economic advantage from the return to or preservation of full earning capacity of these early diagnosed cases, and the enormous impetus to the cause of right living which would follow?

THE DIAGNOSTIC USE OF TUBERCULIN

[NOTE.—In the absence of Dr. W. L. Dunn, who had expected to present a paper on this topic, Dr. Edward R. Baldwin, of Saranac Lake, consented, at the request of the Chairman, to discuss the subject extemporaneously.]

Dr. Baldwin: I am glad it is to be an extemporaneous talk; that "lets me out" if I make mistakes! There are a few points which it seems to me worth while to speak about. The tuberculin reaction is certainly very much misunderstood. In the beginning it was regarded as an infallible test of tuberculosis in the particular individual who reacted. If the reaction occurred, it was supposed that the disease tuberculosis was present. In the last five years we have learned that this is not necessarily true. In truth this fact about the reaction has been known for many years to veterinarians, and they have been discussing for years whether it was worth while to use the test for diagnosis.

Skin tests and eye tests—to use rough terms—have shown us that nearly all adult individuals, especially those living in large cities, have a certain amount of tuberculous infection. However, these individuals are not necessarily ill, and do not necessarily suffer from signs and symptoms of the disease.

What, then, has been the outcome of this discovery? It has been that we have regarded the tuberculin test as of very limited value in detecting tuberculous *disease*. We still know it is of extreme value in detecting tuberculous *infection*, but with the full knowledge that a great many people have tuberculosis, but not in a form which would require treatment, we have, therefore, to regard the tuberculin test with positive reaction as of very little value. This does not say that it cannot be used with some degree of success in assisting diagnosis in cases of pulmonary tuberculosis.

It is not infrequent, in recent sanatorium experience, to have patients referred from physicians, and the sole reason for the diagnosis was because of a positive skin reaction! This should not be so if that physician had had sufficient experience. A great many healthy people—doubtless he himself—would have given the same reaction. It is, therefore, of little value in diagnosing tuberculosis in adults.

When you have a case of suspected tuberculosis with rather indistinct symptoms and cannot make a diagnosis by any methods you have access to, the tuberculin skin test may assist in *excluding* tuberculosis if it is not present. If the skin test is negative, it gives you some assurance and a hint to be cautious where a mistake might be made in diagnosis. Yet this does not surely exclude tuberculosis. Where the skin test is negative on repetition, it is then proper to go on and try the subcutaneous test as a crucial test, which has very few exceptions.

When we speak of children, the matter is different. The pediatrists have discovered that almost all infants are free from tuberculosis up to one year. From that time on the infection increases gradually, until, by the age of fourteen or fifteen, fully half of the children attending hospitals and clinics are found to be infected with tuberculosis. If a positive reaction occurs in a child of ten or under, it has a diagnostic value. It is likely that the child should be treated or at least watched. If no symptoms have appeared before the test is made and the test is positive, it may be said without doubt the child has not had tuberculosis long. Therefore it would mean, if positive, that the child should be kept under observation if it were not ill. As most children are not brought to the physician for examination except when ailing, it is wise to look for signs of tuberculosis when a positive reaction is obtained. The tuberculin reaction in children is, therefore, of great value and must not be ignored. We know that tuberculosis is widely prevalent throughout the civilized world in a somewhat inoffensive form—that is, most of us are carriers of tuberculosis. Maybe it does us good—probably it prevents us from having a more serious form—to have had a small amount of infection. We must then carefully discriminate between tuberculous infection and tuberculous disease. Until we are able to do that in relation to tuberculin diagnosis the physician who uses tuberculin as a test is not fit to interpret his reaction. We must have other symptoms in addition to reaction, except in children. The result must also be considered according to the dose which produces the reaction. It is possible for one who is familiar with the use of tuberculin as a test to get some value out of it, *i. e.*, a positive reaction may confirm a suspicion. A very violent reaction from a small dose subcutaneously is, no doubt, evidence that a recent infection has been present, but not absolutely certain. We must have with it other symptoms of the disease to make it of real value.

DISCUSSION ON PAPERS BY DR. BROWN, DRS. WHITE AND VAN NORMAN, AND DR. BALDWIN

Dr. Hugh M. Kinghorn, Saranac Lake: The use of tuberculin is to be considered as a bacterial extract for active immunization. I may say at the outset I will deal with Koch's tuberculin. The question arises, Is it possible to obtain an active immunity by the injection of a bacterial extract into an organism that is already infected with tuberculosis, and in which there are pathological changes? The answer is to be found in the fundamental experiments of Koch. If a normal guinea-pig is inoculated with tubercle bacilli, the seat of inoculation very soon closes. In ten to fourteen days there appears at this site a small, hard nodule which finally ulcerates. This shows no tendency to heal and remains so until the death of the animal. If an already tuberculous guinea-pig is similarly inoculated, the seat of inoculation closes, but no nodule develops. Instead of that a necrotic area of skin develops, but finally heals over. In explanation of this experiment it must be said that the first injection, although it had a fatal effect upon the animal, must have stimulated certain immune reactions within the organism which became manifest after the second inoculation. The experiments of Dr. Trudeau are of equal importance. He took guinea-pigs and divided them into three groups. The first he inoculated with living bacilli; the second with dead bacilli; the third he left as controls. These bacilli were all in attenuated form. Later he inoculated them all with virulent cultures. He found that the group inoculated with the living bacilli lived much longer than those inoculated with dead bacilli. The second set lived much longer than those not inoculated at all. It is important for us to remember that dead bacilli represent what we use as our bacillen emulsion, which consists of ground-up bacilli in glycerin. It is of great importance for us to remember that by this emulsion we can give very definite protection to guinea-pigs.

There have been three periods in treatment with tuberculin. It began in 1890, when Koch first used this treatment. It was given at that time to produce violent and marked reactions. Advanced patients were thus treated, and injections continued until reactions ceased. The result was that tuberculin was much discredited, great harm was done to the patients, and tuberculin fell into disrepute. A very few followers of Koch continued to use tuberculin, and they formed what we may call the second period of tuberculin treatment. They tried to investigate the causes which brought about the failures, and by their efforts they brought about the present third stage of tuberculin therapy, which is the slow process of immunizing. At

this point I wish to mention the great work done by Dr. E. L. Trudeau in placing tuberculin on a safe and sound basis. It seems to me that it is now on a sound basis.

Dr. Estes Nichols, Hebron, Me.: I think one of the most important points in the administration of tuberculin is in making the patient feel he is going to be helped by its use. Frequently you will find persons who do not want to take it. With those patients I always start with sterile water. I sometimes repeat this several times, and then start in with small doses of tuberculin. I think it is a great help. They do not know they are getting sterile water, and they think tuberculin is all right.

I recall one man who had a violent reaction after a small dose of tuberculin. He vomited and was very sick. I gave him several doses of sterile water with the same reaction. I then called him to the office and told him what I had done. After that he went on all right with tuberculin. I think we must first have the confidence of the patients—we must make them feel we believe that tuberculin is going to help them.

Dr. E. S. Bullock, Silver City, N. M.: It is with considerable hesitation that I venture to disagree with the distinguished essayists on this subject, and I am frank to admit that it requires on my part the development of a number of moral courage receptors in order to enable me to do so. However, I would not be true to my own experience if I did not venture a frank expression of my opinion. For many years I used tuberculin according to the method of the Saranac school. I cannot fully recollect the mental process I went through which finally resulted in a marked alteration of technic, though I have no doubt that my final position is related to the method advocated by Drs. White and Van Norman. First, I had to learn that the original dosage advocated by the Saranac school was much too high, for many people are susceptible to millionths of a milligram. A concrete statement of my method is this: The gradual attainment of an effective dose and the repetition of that dose until it is enfeebled by use, when the dose is raised, not lowered; for instance, Dr. Peters and I start with a supposedly safe dose in a fever case, not using tuberculin at all if the temperature runs much over 100° F. daily average maximum, which we take as an indication of tuberculin saturation or relative saturation. We proceed to raise the dose until, should it fortunately occur, there is a drop in temperature. The moment this drop occurs we conclude that we have reached an effective dose. This dose is then repeated until the temperature rises. This rise we interpret as a result of a worn-out dose; then, as it were, we follow the temperature up with an increased dose. In normal temperature cases we follow general

clinical signs and symptoms, particularly lessened or increased fatiguability, as an indication of an effective or worn-out dose. This method was first brought to the attention of medical men by us in a paper read last year at Los Angeles before the laryngologic section of the American Medical Association. No attention was paid to it by American investigators or clinicians, and, therefore, it is with additional satisfaction that I have noted in the recent writings of Eduard Bauer, von Wassermann, and Sahli, of Berne, an allegiance to this method. I am definitely certain that since employing it I have attained success in certain cases which could not be managed in any other way, and that in general my effectiveness in tuberculosis has been much improved thereby.

Dr. E. C. Thrash, Atlanta, Ga.: In discussing Dr. Brown's theory of immunity I wish to state that it is produced by training the cell-structures to activity. The cell, after battling for a long time against the organism, becomes indifferent, and in a measure declares a flag of truce. The cells become satisfied to allow the organisms to go on with their activity. When the attenuated product is introduced into the tissues, the cells can handle this product, and in handling it they are toning up; then they handle it still better, until we finally train them to a degree whereby they can attack the most virulent organisms, just as we train the cells to attack the virus of hydrophobia. Except from the fact that we have an endotoxin and a waxy constituency of these tubercle bacilli, we would have a specific in tuberculosis. In other words, where the endotoxin predominates, the cell-structure of the body will attack the organism in a more feeble way, as they cannot get directly at these toxins. Where the exotoxin predominates, it builds up a barrier to protect its creator, and if you can rid the system of this barrier with antitoxin, the cell-structure can attack the organism and destroy it. In this disease the organism is protected against the cell and we have a leukopenia. The white blood-cells cannot attack these organisms vigorously, and nature protects herself by building up granulomata. In all granulomatous diseases we have leukopenia. When the germs begin to grow in the tissues, nature begins to build a wall around them in the form of tubercles. She protects herself in this way, but at the same time there is a vicious condition produced whereby she impairs her power to protect by walling them up—cementing them up so the body fluids and cell-structures cannot get at them. For this reason the antibodies cannot reach them in these tubercles. My experience has been that tuberculin has been a specific in pleuritic and peritoneal tuberculosis. Every simple case of this kind has melted away under tuberculin in my hands. The reason is in these cases you do not have

extensive caseation and calcification and no mixed infection, as you have in the lung. Now, when you get this caseous material surrounded by endothelial and epithelioid cells, not only can the bacteria not get out, but antibodies cannot get in, and they lie there defenseless, in a measure, and yet they are protected, so when the wall does break down, they can be disseminated through the body and set up a more or less general infection.

Dr. William Charles White, Pittsburgh: It was a great pleasure to listen to the paper of Dr. Brown. He has, I think, after Dr. Trudeau, been one of the most persistent pursuers of the truth.

It seems to me that I have seen but three things that make me confident there is value in tuberculin—one, Dr. Trudeau's experiments on rabbits' eyes; the second, one case of Dr. Phillips' where he drew a smear of tuberculin ointment across a lupus, and where the smear was drawn the lupus healed, but the lupus above and below the smear remained unchanged; the third, ocular tuberculosis, as reported by Saathof, which responds with redness and healing to large enough doses of tuberculin. These three instances are all I know of that establish any degree of faith in tuberculin as a therapeutic agent. These three are positive evidences, because one could actually see the evidences. Now, I have taken tuberculin off and on for nearly six years,—all sorts of tuberculin and all sorts of doses,—and I have scarcely missed two weeks' time in all that six years that I have not had a dose of tuberculin of some sort. Only the times that I have had enough tuberculin to give me a reaction have I felt any assurance in myself that it made any difference whatever whether I had tuberculin or not. If one is to give tuberculin, I think two things are valuable: one is to give tuberculin in sufficient doses to get a reaction, and the other is to keep at a dose of tuberculin which will give a reaction of a certain grade. Outside of this I cannot offer anything of value.

Dr. V. Y. Bowditch, Boston, Mass.: I was strongly skeptical of tuberculin for many years. After using it a few times I dropped it like a hot potato. Watching the work of Dr. Trudeau, I finally came upon one case which I will mention. It was that of a working-girl, with both lungs involved. After six months' treatment at Sharon Sanatorium the cough disappeared, and she had all the appearances of health. She went home, and, as I expected, relapsed. She came back and was treated for three months, but was steadily going downhill. I said to my assistant, "Possibly we are keeping something from this girl we ought to give her." I put it to her; she demurred, but finally consented. The first month she coughed and expectorated much more. Then she began to improve. At the end of six

months she was the picture of health, and at the end of eight years is still in perfect health.

Another case was going downhill under ordinary sanatorium methods. I began with her in the same way. In six months she was well and has remained so ever since. These two cases so impressed us that we kept on using it with more or less success. We are still conservative as to its use, but I will state that I myself am much impressed with the results and think my early repugnance to its use was foolish.

Dr. John Ritter, Chicago: I cannot reconcile myself to the use of tuberculin for diagnostic purposes in any other way than intracutaneously and not subcutaneously, as so erroneously stated. I have tried it in a good many cases and I teach its use by that method.

We must admit that in the use of tuberculin for therapy there is a psychological factor. If you give a patient tuberculin for some time and then discontinue it, the patient will invariably come back and ask that it be again given. Nevertheless, I believe it is of decided therapeutic value.

The three varieties or modifications of tuberculin that Dr. Brown is using conform with Hans Muck's recent researches of the different bacillary constituents plus tuberculin.

Harold Varlow, of England, has shown that other substances introduced in the same way as tuberculin frequently have a beneficial effect. He injected a 1 per cent. solution of carbolic acid in 0.1 to 0.2 c.c. doses into tuberculous subjects, and reports that the symptoms of cough, lassitude, night-sweats, loss of appetite, all subsided like under one of tuberculin. Now, I would like to know whether it is the product of the bacillary growth, the endotoxin, the small amount of carbolic acid in the tuberculin, or the psychological effect in the use of tuberculins that is the most potent for good.

Dr. Gordon Wilson, Baltimore: Although it is difficult, in the vast majority of cases, to say that tuberculin brought about a cure, yet now and then we do meet with a case where there is practically no doubt that the cure can be ascribed to tuberculin alone, and I would like to cite one case belonging to this class. A young girl was referred to me by a laryngologist for tuberculin treatment on account of her having a tuberculous ulcer on the pharynx, another on the uvula, and a third on the tongue, just anterior to the glottis. There could be no doubt as to the diagnosis, as tissue had been removed which was found to contain giant-cells and tubercle bacilli. She had been treated under extremely good hygienic conditions for a period of six months, during which time the disease had progressed steadily, and in order really to test out the efficacy of tuberculin in her case, absolutely no

change was made in the hygienic or local treatment, but she was given, at regular intervals, increasing doses of tuberculin. Within a period of five months the ulcers had entirely healed, and when I last saw her, three years later, she was in perfect health with no return of the disease.

I think, however, that the greatest advantage of tuberculin when used by patients who have returned to their usual normal home life is that it brings the patient more closely under the control of the physician, and in that way any decline from the normal can be ascertained early, and the conditions bringing it about readily corrected.

Dr. H. L. Barnes, Wallum Lake, R. I.: I think we should pause before we allow our judgment to be influenced by striking cases. We want to remember the striking cases of improvement from the rest cure when the tuberculin is not given. We should not forget these when mentioning the striking cases treated with tuberculin. If the value of tuberculin treatment is ever placed on a sound basis, it will have to come, in my judgment, by statistics, and it is very hard to get statistics. I have not been able to get the good results with tuberculin which are claimed by many.

Dr. S. Wolman, Baltimore: Every man can tell of a case that got better against his expectations, and others can retaliate by telling of cases that did not get better. These special cases have, unfortunately, been the basis of discussion. Dr. Brown pointed out too briefly, what I wish to emphasize, in the hope that in future years we of this Society will talk about better things. It is hard to tell when a patient is better and when he is not. We all know that. In Germany and other places the chief methods of classifying are, first, financial—the amount of work he does; second, duration of life after he leaves the physician's care; third, sputum statistics. I wish to make a plea that in the future no remarks be allowed on tuberculin unless the sputum statistics or duration of life are also given. We all know patients who work when they have no business to, and other discharged patients are too lazy, although they are able to work. I think the sputum statistics, if properly kept, are significant. If we find that the bacilli clear up to a larger extent by one therapeutic method than by any other method, I believe we have something tangible. Last year Loewenstein published 682 cases studied in this way. If his results can be confirmed, those who believe in tuberculin have something to point to.

The discussion here today has been largely hinged on whether we should or should not get a reaction. Some have said that we ought to get a reaction. What they mean is a slight reaction.

We can get a reaction in the skin, but we cannot show whether or not

there is a reaction in the lung. We do not contest Dr. White and Dr. Van Norman's work, but we have at the Phipps Dispensary carried out regularly cutaneous tests before and during tuberculin treatment, and we have been shocked at the way these figures contradict Dr. White's work. There is an unfortunate lack of agreement between our statistics and theirs.

Dr. Boyd Cornick, San Angelo, Tex.: There is no question that tuberculin possesses diagnostic properties of great value. It is not infallible, but it is a great help in some cases. It also possesses therapeutic properties. I have given it by several different methods, according to accepted teachings. The longer I use it, the smaller the doses I give. The most valuable suggestion I have heard today with regard to tuberculin came from our President's address: that nature, during the process of cure, elaborates tuberculin in the system and thereby stimulates the formation of antibodies. That established fact possesses more value, both in promoting and in accounting for nature's process of cure, if we thoroughly appreciate it, in my judgment, than any artificial administration of tuberculin as a therapeutic agent. I think, Mr. Chairman, that there should be discouraged from every authoritative source an impression among the medical profession throughout the country that you can cure tuberculosis with medicine from bottles. I do not believe it; and yet I use tuberculin every day in selected cases for one purpose or another. I use tuberculin as a diagnostic, regarding it as not infallible; as a prognostic, by the von Pirquet cutaneous method of application, believing it gives me information how the patient is getting along; as a therapeutic agent in carefully selected cases. If we remember that nature elaborates tuberculin in the system, which then stimulates the formation of antibodies, provided the physical system is well nourished, we can recognize how we may get along on minimum doses of tuberculin. I have never appreciated the value of increasing the dosage up to the limit of tolerance, as is practised by some physicians of great repute, since I have known that tuberculin contains toxins only, and does not contain antitoxins nor any other of the various defensive antibodies.

Believing, as I do, that the only possible way in which tuberculin can promote nature's processes of cure is by stimulating the formation of antibodies in a fairly well-nourished physique, and that this desired end is frustrated in a measure if we administer enough to produce even temporarily a negative opsonic index (as shown by a febrile reaction), I have for some years past employed only a minimum dosage, which is ample for the purpose desired, and am persuaded that even this is uncalled for if the patient's fever

is not already satisfactorily responding to rest, or if his impaired nutrition is not already yielding to improved alimentation.

Dr. Lawrason Brown, Saranac Lake: I have very little to add. In regard to a diagnosis of tuberculosis from these tuberculins, I might say that for years we made it a routine to give every patient without tubercle bacilli in his sputum who came to the sanatorium subcutaneous tuberculin tests. We had no bad results,—no permanently bad results,—though the tuberculous patient requires very little to upset him for some time. A few did not do well for several months after a violent reaction. We began finally to feel it was probably wiser to make a diagnosis in some other way than by the subcutaneous test. Consequently for some time we have not been giving it. Sometimes patients whom you think ought to react and have bacilli in the sputum do not react, and some that you do not expect to react do react. Considering all these facts I have come to look upon tuberculin tests in diagnosis as of little importance without physical signs or symptoms. If the physical signs and symptoms indicate tuberculosis and the patient does not react, I am still suspicious. For that reason I have lost a great deal of confidence in the tuberculin test for diagnosis.

In regard to the discussion as to the use of tuberculin therapeutically it is these few and rare cases which make us all give tuberculin, for once in a while we see excellent results which cannot be attributed to anything else, but if you study the statistics, you will be surprised to see how few such cases you get.

Dr. William Charles White, Pittsburgh: I rise only to correct two impressions which Dr. Wolman may have left you. We have never claimed that we got focal reactions in the lung with our dosage, although we have seen several cases that indicated such reaction. In the last year we have seen two cases of localized tuberculosis in which it seemed there was a definite relation between the reaction at the site of infection and the reaction around the tuberculous area. We can certainly measure the dose that will give a certain grade of reaction at the site of the injection, but we have based it only on this local reaction. It is hardly fair to use the intradermic method and say the cutaneous method is of no use. These two impressions I wish to correct.

REPORT OF THE COMMITTEE ON NOMENCLATURE OF THE AMERICAN SANATORIUM ASSOCIATION

By Lawrason Brown, M.D., *Chairman*

There has been a growing feeling of unrest in regard to the nomenclature adopted in 1909 by the American Sanatorium Association. The Committee feels that this is a healthy sign, for unless nomenclature and classification can, within certain limits, possess that function of living organisms known as change or growth, they will quickly be found to be antiquated and not tools for living, advancing men to work with. It is needless for us to say that no two of us are of one mind in regard to this classification or indeed in regard to any other. We approached the subject with considerable hesitancy for we knew that many valuable records had been published under the old nomenclature. What really brought the matter to a head and caused our president to appoint this Committee was a suggestion that the period named under the term "apparently cured" should be changed from three to six months. This, of course, would enable many dispensaries to publish lists of "apparently cured," but for most sanatoria the term would be dropped, which in itself your Committee would not think such a bad thing, did it not invite invidious comparison of results to the detriment of the sanatorium, which your Committee feels would be a grave injustice, for they are unanimous in upholding the sanatorium as by far the best therapeutic institution for the treatment of pulmonary tuberculosis. All of us know that tuberculosis is not cured in six months or even after two years, but when the history of the tuberculosis movement is considered it furnishes, we believe, sufficient excuse for employment of the term "cured." The people were not educated up to what tuberculosis is when our President, with the courage of his convictions, refused even early in the last decade of the last century to use the term "cure." Others, however, felt that, for the time being at least, it was wisest to make use of this term, for laity, legislators, and even physicians at that time did not believe that pulmonary tuberculosis could ever be cured or even permanently arrested. Dr. Osler, at that time, too saw the light clearly through his pathological

experience. Had not the term been used, we believe that the anti-tuberculosis movement might have been years behind where it is today. But how is the term really used today? We must all acknowledge that it indicates only in rare instances "cure," for we believe that it requires years for the tubercle bacillus to die out when once it has gained a foothold in the tissues and made some headway. Have we any right to apply the word "cured" to these patients?

Your Committee believes that the time has now come when it is wise to tell the people, who have thus far been left partly in ignorance, the real facts of the case. They believe that the sanatorium men should take this upon themselves as their duty. They should impart the knowledge that tuberculosis is as curable today and more so than it was ten years ago, but that further study has led us to the knowledge that it is most difficult to say who is cured and when, if such be the case, the cure is arrived at.

For these reasons we believe it wiser to substitute in our terminology the words "apparently arrested" for "apparently cured," and "arrested" for "cured." In place of "arrest" we suggest the use of "quiescent," and in the place of "well," the term "condition of health satisfactory."

Dr. Brown, Chairman of the Committee on Nomenclature of the American Sanatorium Association, stated that the above report had already been adopted by that Association.

After active discussion the following resolution was adopted by the Section:

Resolved, that the Clinical Section recommends to The National Association for the Study and Prevention of Tuberculosis the adoption of the report of the Committee on Nomenclature of the American Sanatorium Association.

This resolution was referred in regular order to the Board of Directors of the National Association. The Board voted to appoint a special Committee of Seven to consider the question of nomenclature, having due regard for international systems of classification, to confer with the American Sanatorium Association on the subject, and to report to the Board of Directors.

NOTE ON THE DEATH-RATE FROM TUBERCULOSIS IN VARIOUS LARGE MUNICIPALITIES

By Hermann M. Biggs, M.D.
New York

An impression has been gaining ground in a considerable well-informed section of the medical profession, and also among the laity, that the tuberculosis death-rate in large municipalities is no longer decreasing, but on the contrary is increasing. At the last International Congress on Tuberculosis in Washington in 1908 Dr. Koch directed attention to the nearly stationary character of the death-rate in numerous cities, and suggested that, perhaps, a further decrease would not be forthcoming until some new features were introduced in the tuberculosis campaign, especially emphasizing the importance of providing adequate hospital accommodation for the care of advanced cases of this disease, in order that infection of other members of the family during the late periods might be prevented.

This feature of the work in prevention has been emphasized on all sides during the last few years, and great progress has been and is being made along this line. This, in connection with the development of clinic work and the sanitary supervision of the patients among the poor in their homes, is to a large extent responsible, in my opinion, for the recent decrease.

There can be no doubt that the rate of decrease of the death-rate in this disease in numerous countries and cities has been largely proportionate to the activity and energy with which the campaign for prevention has been carried on. It is my desire in these notes simply to give the general death-rates and the death-rates from pulmonary tuberculosis in a few of the representative cities of this country and of Europe for the last ten years, to show the decreases which have taken place:

DEATH-RATE PER 1000 POPULATION FROM ALL CAUSES AND FROM PULMONARY TUBERCULOSIS IN FOUR LARGE AMERICAN CITIES

Year	New York		Boston		Philadelphia		Chicago	
	Death-rate	Rate Pul. Tbc.	Death-rate	Rate P. Tbc.	Death-rate	Rate P. Tbc.	Death-rate	Rate P. Tbc.
1901	19.91	2.29	19.87	2.36	18.26	2.23	13.93	1.42
1902	18.58	2.07	19.07	2.16	17.70	2.11	14.69	1.41
1903	17.96	2.12	18.23	2.10	18.89	2.22	15.62	1.55
1904	19.99	2.18	18.21	2.16	18.56	2.23	13.85	1.65
1905	18.31	2.12	18.41	2.05	17.41	1.99	13.96	1.64
1906	18.35	2.16	18.61	1.93	18.86	2.18	14.50	1.61
1907	18.76	2.10	18.60	1.81	18.60	2.14	15.70	1.69
1908	16.52	2.01	18.30	1.70	17.50	2.04	14.57	1.59
1909	16.23	1.89	16.80	1.63	16.23	1.87	14.58	1.55
1910	15.98	1.81	17.18	1.73	17.29	1.85	15.14	1.53
1911	15.13	1.76	17.08	1.55	16.50	1.87	14.55	1.66

DEATH-RATE PER 1000 POPULATION FROM ALL CAUSES AND FROM PULMONARY TUBERCULOSIS IN THREE LARGE FOREIGN CITIES

Year	London		Paris		Berlin	
	Death-rate	Rate Pul. Tbc.	Death-Rate	Rate P. Tbc.	Death-rate	Rate P. Tbc.
1901	17.24	1.81	18.30	4.32	18.00	2.18
1902	17.00	1.66	18.10	4.26	16.08	2.03
1903	15.23	1.59	17.20	3.89	16.38	1.91
1904	16.25	1.65	17.70	4.55	16.81	2.09
1905	15.15	1.45	17.40	4.21	17.20	2.09
1906	15.67	1.48	17.50	3.75	15.80	1.87
1907	15.16	1.40	18.50	..	15.43	1.86
1908	14.68	1.34	17.49	3.87	15.54	1.85
1909	14.00	1.32	17.40	3.71	15.54	1.85
1910	12.71	1.14	16.70	3.59	14.65	1.78

INDUCED PNEUMOTHORAX IN THE TREATMENT OF PULMONARY DISEASE

By Louis Hamman, M.D., and Martin F. Sloan, M.D.
Baltimore

Rest has long been accepted as an important condition for the recovery of inflamed tissues. In many locations pain necessitates it, and physicians exaggerate and prolong the remedial measure that nature suggests. Particularly in tuberculous infections has its enforcement given brilliant results. Numerous observations have led to the conclusion that rest is as valuable a remedy in pulmonary tuberculosis as in tuberculosis of other regions. Toward the end of the last century the frequently beneficial effects of pleural effusion upon tuberculous lesions in the lung were emphasized. The relation is often striking. Concomitantly with the appearance of fluid, fever abates, cough and sputum decrease, and the patient's general condition improves. Aspiration of the exudate is followed by a recurrence of the previous symptoms, which again subside as the fluid reaccumulates. L. Spengler has published striking instances of this not uncommon occurrence. Galliard writes of such effusions under the title of "pleurisies providentielles."

One of the most dreaded complications of advanced tuberculosis of the lungs is the occurrence of pneumothorax. Coming, as a rule, at the end of a prolonged and wasting illness, it usually marks the rapid approach of death. However, pneumothorax is, in itself, a very benign condition. The rapidly widening experience with induced pneumothorax attests this. In healthy individuals, a complete collapse of one lung may occasion but trifling symptoms and easily escape detection. We have observed two instances of spontaneous pneumothorax in otherwise healthy men, with only slight dyspnea on exertion, and a transient "stitch" in the side. The fatal effects of pneumothorax in pulmonary tuberculosis must be ascribed to associated conditions. Usually it is but a terminal event in a patient worn by rapidly advancing disease and already overshadowed by death. The almost constantly associated pleural infection adds a further extensive

area of absorption, and in some instances the mechanical conditions at the point of rupture induce fatally high intrapleural pressure.

Although there are many points of great interest in connection with the technic of inducing pneumothorax, we cannot, in the short time at our disposal, stop to discuss them, in spite of their importance. The apparatus for manipulating the gas is of simple construction. Numerous different types of apparatus have been devised. Briefly, two methods are at present in use for inducing pneumothorax:

1. Brauer's method, which Brauer himself calls the Brauer-Murphy method, although the procedure recommended by Murphy is certainly much more like the operation of Forlanini. Brauer's method consists in exposing the pleura under cocain anesthesia and piercing the pleura with a blunt trocar, which has a side opening through which the gas is allowed to flow between the pleural surfaces.

2. Forlanini's method, which consists in introducing a small-caliber aspirating needle, connected with a suitable apparatus, through the intercostal space, and thrusting it carefully forward, determining when the point is in the pleural cavity by manometric readings.

The technic described by Forlanini in his last article is a much more conservative and cautious manipulation than the procedures he had previously advised. In his earlier articles he had laid little emphasis upon the value of the manometer. He now admits its indispensability. Forlanini's method is extremely simple, gives little pain, and has the decided advantage that if it is impossible to find a free pleural space at one position, further attempts may be made in other locations. Brauer, while admitting the inconvenience of the method that he advocates, feels that its greater safety should urge its general adoption. The danger that is dreaded is the risk of producing cerebral air embolism. It is impossible to enter into the discussion that has been waged in favor of the one or the other of these two procedures. We wish merely to say that in our own experience a modified Forlanini method has given satisfactory results, and we feel that a consideration of all the data at present available points to a cautious use of the method as entirely justified and without danger.

One who is engaged in the study of induced pneumothorax cannot but feel an intense interest in every detail of the technic employed, of the difficulties that are met with, and how best they can be overcome. However, we must forego the temptation to enlarge upon these questions, as we think a record of the cases that we have treated is of far more importance. During the past year, up to the first of last April, we had induced, or

at least attempted to induce, pneumothorax in 15 patients with pulmonary tuberculosis.

The application of induced pneumothorax has not been restricted to any particular disease or type of case. It has been made use of chiefly in pulmonary tuberculosis, but Brauer, Schmidt, Wellman, and others have similarly treated patients with bronchiectasis and chronic non-tuberculous infections of the lungs. It is evident that one-sided lesions are the more favorable, but in the late stages of pulmonary tuberculosis it is difficult to find strictly unilateral cases. To what extent the opposite lung may be involved and the patient still be a suitable candidate for the treatment is variously approximated by different observers. Forlanini is lenient in this regard, while Brauer selects his patients with more rigor. It is only reasonable to assume that if immobilization is beneficial, exaggerated activity is harmful. If rest is of value to the diseased lung, we must see to it that the other is not overburdened by the increased demands made upon it. However, it must be pointed out that though both lungs may be affected, the disease is seldom equally active upon the two sides, and as the side with the most marked activity is the one usually chosen for the operation, the opposite lung is generally equal to withstanding the added work put upon it. Experience upholds this conclusion and, indeed, many observers claim that the untreated side is favorably influenced through the diminished toxemia and the improved general condition of the patient that often follows the treatment. Murphy, in his original article, proposed the method particularly for "apical or monolobar tuberculosis in the early stages, as the pathological conditions are such that the compression of the lung can be accomplished and adhesions are not likely to be found. I do not consider," he adds, "that it is indicated or practical in advanced nor chronic tuberculosis, as the fibrous tissue deposited in the lung will not permit compression of the lung, nor will the pleuritic adhesions allow of gas injection." In practice, Murphy's suggestions have never been carried out. All available reports deal only with cases of advanced pulmonary tuberculosis subjected to the treatment. The method is still on trial and the tendency has been to establish its value in instances of the disease that have been uninfluenced by the usual hygienic-dietetic measures. When, even under unfavorable conditions, such value becomes apparent, induced pneumothorax will be given a wider field of application, and we are convinced that the ultimate sphere of its usefulness will be principally in early and moderately advanced cases of the disease. At present it is impossible to represent statistically the results of the treatment. It is only by study-

ing the results in numerous individual cases that one can form an estimate of its value. Our own experience has been gathered from unfavorable and desperate cases of pulmonary tuberculosis. Many of the first patients we operated upon were not selected in any medical sense. They were accepted because, conscious of their progressing disease, they were willing to risk a new method of treatment, while more suitable patients withheld their consent. Recently, we have induced pneumothorax under more favorable conditions, and hope in the future to find the opportunity to test its value in earlier stages of the disease.

We have divided our fifteen cases into four groups: (I) Patients dying after the beginning of the treatment, two cases; (II) patients in whom it was attempted to induce pneumothorax, but where no free pleural space could be found, three cases; (III) cases in which it was possible to induce a partial pneumothorax, but where adhesions prevented a complete collapse of the lung, five cases; (IV) cases in which a complete satisfactory collapse of the affected lung was obtained, five cases.

This is, in many ways, an unsatisfactory classification of our material, but we feel that it will illustrate the difficulties and the results of this method of treatment much more satisfactorily than a classification according to stage of the disease and condition of the patient. After all, with such material as we have had at our disposal, any sort of statistical evaluation of the results would give an entirely erroneous impression. Each case must be considered alone in order to get the proper expression of its relation to the treatment. This necessitates that we give, although ever so briefly, an account of the fifteen cases that have been under our observation. It will be impossible to draw more than the barest outline of each case, but we hope that, in a few words, we can point to the important and salient features.*

GROUP I

In the first group there are two cases.

Case No. 1. Male, aged forty-one, entered Eudowood Sanatorium with advanced pulmonary tuberculosis in May, 1911. He had fever and showed progression of the disease, with aggravation of his general symptoms during his stay in the hospital. He had a pleural effusion at his left base. Upon withdrawal of the clear serous fluid, air was injected into the pleural cavity, to bring about a more complete collapse of the lung. At the

* Our cases are here reported briefly and colloquially as the paper was prepared for presentation before a medical society. At some later date they will be published in detail.

next operation, undertaken a week later, the fluid was found to be purulent. In other words, following the first operation, the fluid became infected. There was no evidence of rupture of the lung, and while it is possible that the pleural cavity may have become incidentally infected from the lung, we must admit that the probability points to infection of the pleural cavity, through some slip in technic at the first operation. The patient grew progressively worse and died the following November.

Case No. 2. A male, aged thirty-five years, entered the sanatorium on the 25th of August, 1911, with far-advanced disease of both lungs, excessive cough, and profuse expectoration, and temperature running up to 102° F. in the afternoons. The right side was extensively involved, there being marked infiltration throughout the whole side and a large cavity in the upper lobe. On the left side, physical examination indicated involvement of the upper lobe only. On August 30th, pneumothorax was induced in the right side. On the 31st, a second injection was made. Following this inflation the patient began to complain of severe headache, grew more and more apathetic, and finally developed outspoken signs of tuberculous meningitis. He died on the 21st of September. Tuberculous meningitis is not a rare terminal event in pulmonary tuberculosis, and we have not felt that the induction of pneumothorax could in any way be held responsible for the development of tuberculous meningitis.

GROUP II

Case No. 1. A girl, aged sixteen, entered Eudowood Sanatorium on March 4, 1911, with fever and associated marked constitutional symptoms. The whole right lung was extensively involved and the left upper lobe showed slight involvement. During the spring the constitutional symptoms continued unabated, and examination in July showed marked advance of the disease in the lungs. There was more marked involvement on the right side, and a large cavity had formed in the left upper lobe. On the first of August several ineffectual attempts were made, by the Forlanini method, to reach the pleural space. On the second of August the Brauer operation was performed, the parietal pleura exposed, and the cannula pushed into the pleural space. It entered a network of adhesions, and the introduction of small amounts of air gave great pain and pressure-variations characteristic of dense pleural adhesions. Further attempts to produce pneumothorax were then abandoned, on account of extensive adhesions. The patient's disease was uninfluenced by the attempts to produce pneumothorax. The patient died the following December.

Case No. 2. A female, aged nineteen, entered Eudowood Sanatorium in April, 1911. Examination showed extensive infiltration of the whole left side and some infiltration at the right apex. The temperature ranged from 101° to 103° F., with associated marked constitutional symptoms. In July, the temperature still persisted and a large cavity had formed in the

left upper lobe. On the sixteenth of July, and during the four weeks following, numerous attempts were made to induce pneumothorax. It was never possible, in any of these attempts, to produce more than a very small pocket of air. As a rule, several hundred cubic centimeters of nitrogen could be introduced, but the manometer showed the pressure-variations characteristic of pleural adhesions and no definite pneumothorax was ever obtained. The introduced air produced only emphysema of the pleural adhesions. Since the unsuccessful attempts at producing pneumothorax, the patient's disease has continued to progress.

Case No. 3. Female, aged forty-two, entered Eudowood Sanatorium in November, 1911, with a far-advanced lesion involving principally the right side. Temperature was elevated and there were other grave constitutional symptoms. Four unsuccessful attempts were made to reach the pleural cavity, which, in all four positions, was obliterated by adhesions. Since the attempt, the patient's constitutional symptoms have persisted, and although she has been kept in bed the disease has gradually progressed.

GROUP III

Case No. 1. Male, aged twenty, entered the sanatorium in September, 1910, and showed at that time extensive infiltration on the left side, with a cavity in the upper lobe and less intense but extensive infiltration in the upper and middle lobes on the right side. He had fever, his temperature ranging from 101° to 102°F. in the afternoon. During the first ten months of his stay in the hospital there was some improvement in the general symptoms, but the disease continued to progress and he never completely lost his fever. With such advanced bilateral disease, it was deemed inadvisable to attempt to produce a pneumothorax. However, the patient begged so insistently to be given this one chance of benefiting his condition that we finally yielded to his request. The lesion on the left side being more advanced than the one on the right, this was chosen for the treatment. The pleural space was at once found, and 600 c.c. of gas were readily introduced. During the following month increasing amounts were added, until, at the end of about four weeks, he had a fairly extensive although not a general pneumothorax. Following the induction of the pneumothorax there was a marked diminution of cough and expectoration. There was, however, little change in the temperature or in the general condition. At the end of six weeks it was noted that the lesion on the right side showed signs of increased activity, namely, more abundant râles, and it was decided to push the treatment no further. The patient's general condition grew gradually worse and he died in the early part of January. It is remarkable that in spite of the extensive bilateral disease the pneumothorax gave the patient no other discomfort than some increase in his dyspnea.

Case No. 2. Male, hatmaker, twenty years of age, entered the sanatorium in October, 1909, with extensive disease of the right side and

less marked disease on the left. Patient responded at first to the routine hygienic-dietetic treatment, and was able to be up and about. His main complaint was shortness of breath. In the spring of 1910 he developed fever and other constitutional symptoms, and his disease spread. He was confined to a bed or chair for many months, and the least exertion made him breathless. He received tuberculin treatment during the summer and fall of 1910, without any apparent benefit. This patient, too, was insistent in his request that a pneumothorax be performed, and since it was difficult to induce patients not so extremely ill to submit to what they considered a new and experimental treatment, we decided to grant his request, in the hope that demonstrations of the harmlessness of the method would encourage others to give the method a trial. We never hoped to accomplish much with this patient by inducing pneumothorax. On July 9th pneumothorax was induced on the right side without any difficulty and the following few weeks was maintained and increased in extent. The patient suffered severely from dyspnea, and after each inflation felt discomfort and on one occasion had nausea and vomiting. After a number of inflations there was a marked decrease in the amount of cough and expectoration, otherwise the pneumothorax seemed to have no especial influence on the course of the disease. The temperature continued as it had been before and the patient lost somewhat in weight. Only the lower and middle lobes of the right lung collapsed; the upper lobe remained fixed by adhesions. The compression was maintained for five months; then, as there was no improvement in the patient's general condition, further treatment was abandoned. At this writing his lesions are slowly progressing.

Case No. 3. Male, aged thirty-eight years, was transferred from the Johns Hopkins Hospital to Eudowood on August 3, 1911. He had entered the hospital with fever and cough, and was suspected of having typhoid fever. The sputum examinations and the further course in the physical signs established a diagnosis of pulmonary tuberculosis. On admission there was infiltration on the whole right side, except perhaps the lower part of the middle lobe, and râles throughout the left upper lobe. On August 8th, a right-sided pneumothorax was induced, without any difficulty, and further refillings were easily accomplished at varying intervals. The patient showed little improvement in the first few weeks, but since then has gradually but markedly improved. His cough has greatly diminished, he has very little sputum, from which the tubercle bacilli have disappeared, and he has much less shortness of breath than he had when the pneumothorax was first induced. He has gained steadily in weight, now weighing fifteen pounds more than he did when admitted. He has no fever and gives valuable help in doing light work about the institution. The pneumothorax, although a large one, was never complete. Anteriorly and over the diaphragm there is a large pneumothorax, with marked displacement of the mediastinum. However, the lung is completely adherent behind and moist râles may be heard on quiet breathing, from the apex to

the sixth or seventh dorsal spine. The patient has shown marked improvement since admission.

Case No. 4. Male, aged thirty years, a barber. He entered the sanatorium on the second of November, 1911. There was extensive but not intense infiltration throughout the greater part of the right lung, and numerous moist râles in the left upper lobe. Pneumothorax was easily induced on the right side and has been maintained by refillings since. The patient's general condition has somewhat improved, although he has been quite short of breath,—more so than any of our other patients. The most marked feature following the induction of pneumothorax was the diminution in the amount of cough and expectoration. The pneumothorax on the right side is large and there is marked displacement of the mediastinum, but the upper lobe is bound to the chest wall by adhesions.

Case No. 5. Female, aged twenty-one, was admitted to the sanatorium on the fifth of December, showing extensive consolidation of the right upper lobe, with a large cavity and infiltration throughout the whole side, and râles in the left upper lobe. After three unsuccessful attempts to find a pleural cavity in the right axillary area, the needle was introduced on the twenty-first of December in the midscapular line and at once entered the pleural space. Further inflation showed that a partial pneumothorax was formed, the anterior part of the lung remaining adherent to the chest wall. The patient experienced considerable pain with each inflation, due, no doubt, to the stretching or tearing of loose adhesions. The treatments were continued until the middle of February, the pneumothorax being maintained for two months. There was definite diminution in the amount of cough and expectoration. In the middle of February the patient had an aggravation of symptoms, the temperature going up, for a number of days, to 102° F. in the afternoon, cough and expectoration increasing, and it was thought that there was definite evidence of extension of the disease on the left side. On this account no further treatment was given. The temperature elevation and constitutional symptoms proved to be but temporary. Since their subsidence the patient has continued approximately in her previous condition.

GROUP IV

Case No. 1. A woman, aged thirty-one, admitted to the Johns Hopkins Hospital on June 4, 1911, with fresh disease of three months' standing, involving the whole of the left side and a diffuse, apparently healed lesion on the right side. The results of the physical examination were confirmed by *x*-ray findings. On June 21st, pneumothorax was induced on the left side by the Brauer method. Subsequent inflations were done so as to keep the lung permanently collapsed. In January, the patient had an attack of pleurisy, followed by an effusion. The effusion has persisted since then.

The results of the pneumothorax in this instance were most encouraging. Following its institution, the fever which the patient had on admission, and had had for several months before admission to the hospital, gradually subsided, the pulse-rate and the respiratory rate decreased, and the cough and sputum, which had both been marked, almost completely ceased. Sputum, laden with tubercle bacilli on admission, was tubercle-bacillus free a few months later, and on repeated examinations through the winter only occasionally have a few tubercle bacilli been found. The patient is at present in excellent condition and has practically no constitutional symptoms.

Case No. 2. Male, aged twenty-one years, admitted to Eudowood Sanatorium on the 27th of January, 1911, with infiltration in the right lung, extending to the fourth rib in front and to the seventh dorsal spine behind, with signs suggestive of a small cavity below the clavicle. A few râles were present at the left apex. On May 9th he spat about 20 c.c. of blood, and had a few small hemoptyses thereafter.

On June 30th he again spat about 20 c.c. of blood, followed by an elevation of temperature and signs indicating increased activity of the disease in the right lung. On July 30th pneumothorax was induced, and after several refillings examination showed that the patient had a complete pneumothorax, with a complete collapse of the right lung. Following the induction of the pneumothorax, the patient had no further hemoptysis, his cough and sputum almost completely disappeared, and his temperature gradually subsided. He was able to leave the sanatorium in September, two months after the pneumothorax was induced. Since then he has been attending to a chicken farm in the country and comes regularly to the dispensary for inflations. He suffers no discomfort from the pneumothorax and is able to attend to his duties, having only a little shortness of breath when, as he says, he forgets and starts to run.

Case No. 3. Male, aged twenty-one, entered Johns Hopkins Hospital during May, 1911, with pleurisy and pulmonary tuberculosis. Patient entered Eudowood Sanatorium on June 26, 1911, with signs indicating infiltration in the right upper lobe and the upper portion of the lower lobe, with râles scattered to the base in back. On the left there was a small area of infiltration at the apex, with diffuse bronchitis, and thickened pleura at the base. Patient had fever and considerable cough, with about 60 c.c. of sputum daily. On the 25th of July a few streaks of blood were noticed in the sputum. Examination in October showed that the lesion on the left side had considerably progressed and that a cavity was forming in the left upper lobe. On the right side the number of râles had diminished. On November 17th pneumothorax was induced on the left side. Following subsequent reinflations, there was a complete left-sided pneumothorax, with complete collapse of the lung. After the pneumothorax, patient progressed satisfactorily, except for several attacks of gastric disturbances. There was, however, no very striking change in his general condition. In March, patient developed pleurisy with effusion, and later it became

necessary to discharge him from the sanatorium on account of irascibility of temper. Patient was much improved at the time of discharge, cough and sputum less, and general condition satisfactory. According to reports he has continued in good condition since then.

Case No. 4. Male, aged twenty-four, entered Eudowood on November 1, 1911, with consolidation of the right upper lobe and infiltration of the middle and lower lobes, and a few râles at the left apex. After having been in bed for three weeks, there was no improvement in the general condition and at this time be began to have hemoptysis. He spat from 2 to 15 c.c. of blood daily for several days. On November 23d pneumothorax was induced. Subsequent refillings brought about a complete collapse of the right lung. After pneumothorax was begun, patient ceased at once to spit blood and his general condition began to improve, cough and expectoration lessened, although for a few days following the first inflation they were increased. Pneumothorax has been constantly maintained; patient's general condition has greatly improved and his local symptoms have become less marked. He is now able to be up and about the institution and assists in light work about the grounds.

Case No. 5. Female, aged twenty-nine, entered the sanatorium in May, 1911, with infiltration in the right upper lobe and râles scattered over the whole side. During the summer the patient did well under the usual hygienic-dietetic treatment, cough disappeared, appetite increased, and she gained considerably in weight. In October she began to have slight hemoptysis, bringing up each day from 10 to 30 c.c. of blood. Examination indicated that there was fresh extension of the disease on the left side, while on the right the disease seemed apparently quiescent. On November 5th pneumothorax was induced. After subsequent inflations, pneumothorax became complete and the left lung completely compressed. Following the first injection of gas, the hemoptysis promptly stopped. Patient has since improved in general condition and at present assists in the household duties at the sanatorium. There is practically no cough or expectoration.

Such a very brief and disconnected account of the cases that we have had under our observation can give only an unsatisfactory impression of the conditions as they really exist, but we think that perhaps it will give a truer impression than any amount of classification that we could do. As we have said, to be justly appreciated, each case must be studied in detail by itself. What we have emphasized is the very advanced cases of pulmonary tuberculosis that we have treated. All but two were in the far-advanced group and these two were moderately advanced cases bordering closely on the far-advanced group. With such material it was not to be expected,

from the first, that much could be accomplished, but necessity forced us to begin in this way.

Out of the fifteen cases a completely satisfactory pneumothorax was produced in only five. In five others a partial pneumothorax was induced. In three the attempts were unsuccessful, and two, as we have described, died shortly after the beginning of treatment. All five of the cases in which a complete pneumothorax was obtained have shown a very striking improvement under the treatment. Their general condition has improved, and what is still more striking is that the local symptoms—cough and expectoration—have been greatly diminished. We feel that we can, without question, say that all five of these cases were distinctly benefited by the treatment, and in one, particularly, a gradually progressing infiltration of one lung has been at least temporarily brought to a standstill. Of the five cases in which it was possible to induce only a partial pneumothorax, in two the treatment was undertaken in spite of the far-advanced bilateral disease. In both of these patients there was some slight immediate improvement in the local signs, namely, a decrease in the amount of cough and expectoration, but their general condition was uninfluenced and they both gradually progressed. In one of the other cases pneumothorax was not maintained long enough to be of any striking benefit. In the other two the condition was certainly markedly improved. In one, particularly, the improvement in the general condition and in the amount of cough and expectoration equaled the improvement in any of the five cases in which the pneumothorax was complete.

We would very briefly summarize the impressions that we have gotten from one year's work with artificial pneumothorax, as follows:

The induction of artificial pneumothorax is an operation unaccompanied by grave danger when it is performed with proper precautions and care.

In approximately 25 per cent. of the cases it will be impossible to induce pneumothorax on account of pleural adhesions.

In only approximately one-third of the cases with advanced disease will it be possible to obtain a complete collapse of the lung. In about an equal percentage an incomplete collapse alone will occur.

In all instances in which a fairly large pneumothorax is obtained there is a striking decrease in the amount of cough and expectoration. We have not observed the immediate striking improvement in the general condition which some authors have reported.

In hemorrhage the induction of pneumothorax is the most reasonable and, it would seem, the most efficient means of controlling the bleeding.

In certain selected instances the treatment will yield relief where the ordinary hygienic-dietetic measures have completely failed.

We by no means believe that the method is applicable to all cases of tuberculosis, or that it is a cure which can be applied in an indiscriminate way. We feel that if the results of the treatment are to be satisfactorily controlled, it will be necessary hereafter to apply the method to earlier instances of the disease than has heretofore been done.

We feel that artificial pneumothorax is a valuable aid to our other methods of treating pulmonary tuberculosis.

A REPORT OF 31 CASES OF PULMONARY TUBERCULOSIS TREATED BY COMPRESSION OF THE LUNG

By Mary E. Lapham, M.D.
Highlands, N. C.

Although two years' experience in treating pulmonary tuberculosis by compression of the lung, by means of nitrogen injected into the pleural cavity, is not enough to warrant any conclusions as to the permanency of our results or the value of the method, nevertheless we make our report without further delay for two reasons: the desire to call attention to a method that is being used with such success abroad, and for the sake of adding our 31 cases to those already reported and thus adding to the data for a critical estimate. As it is not possible to report 31 cases in detail in the time allowed, we shall simply give the general results.

All the 31 cases were typically progressive. All but 1 were well advanced. In 15 cases there is a history of from two to six years' failure to recover. In the other 16 the patient's history and the condition of the lung strongly suggest a prolonged period of development before the clinical outbreak. In all but 2 of the cases one lung was completely involved; in 21 cases both were affected.

In all but 1 case we succeeded in producing a good pleural cavity. The adhesions made the attempt difficult in this case, and as the patient was very ill, we did not persist. She died a few days later.

In 16 cases we succeeded in completely compressing the lung, in 14 only partially.

Of the 16 cases of complete compression 2 have been well for over a year; that is to say, there have been normal breath-sounds and resonance and the lung has been functionally active for over a year. Six of the cases are still uncertain, chiefly for lack of time; 7 may be regarded as recoveries, and 1 has died. This death was a mistake—it might just as well have been a brilliant recovery. When she came to us in July, 1910, she had gone from bad to worse for three years, until the left lung was riddled with destructive

foci—and she weighed only 80 pounds. Her cheeks were blazing with fever, there was persistent coughing, the cachexia was extreme, and there was almost complete inability to digest food. She was sent to us for compression of the lung as the only chance, but she was so frail that it seemed useless to make the attempt. In August, 1910, we began compressing the lung. In two months she was driving, picnicking, playing cards, and eating with a relish. In four months she insisted upon going home, where she went about the shopping districts and where the lung was not properly kept compressed. She came back to us in the summer of 1912 with an empyema and cavity in the second lung and died.

Of the 2 cases that have been well for over a year, 1 came to us in May, 1910, after eighteen months in bed, with persistent fever and frequent hemorrhages. There was a large cavity in the left lung and râles in the right apex. In November, 1910, we compressed the left lung. After two months the temperature, cough, and bacilli disappeared, never to return. Since May, 1911, no fillings have been made. The lung has expanded and throughout shows normal resonance and breath-sounds.

The second case is that of a lawyer, who, after two months of compression in 1910, went home, where he had the fillings kept up, and he has supported his family ever since without the loss of a day's work, and through two attacks of grip.

Of the 16 cases completely compressed, 6 were monolateral, 5 were bilateral at the start, and 5 more became so subsequently. These last 5 suggest the advisability of not putting too much strain upon the lung that has to do all the work. It is possible that the increased hyperemia may be about all that the blood-vessels of the lung can stand, and if any further strain is put on them they will leak. One case had over thirty hemorrhages from the right lung. We compressed it and for five months all went well. Then the patient insisted on going home, where various indiscretions were committed, ending with a long cold drive in the rain. Coarse wet râles appeared over the larger bronchi of the other lung, so that we had to discontinue the fillings for four months until the second lung was safe. Just as we were hoping to begin again, a violent hemorrhage occurred, followed by two milder ones. Fortunately there was no aspiration; we were able to compress the bad lung again, and at present the patient is doing well.

In June, 1911, a man of thirty-five came to us for compression as his only chance. He was running a daily temperature of 100° to 102° F., in spite of six months' rest in bed and careful nursing. We compressed the lung at once. After two weeks the temperature never rose above normal. After two

months the patient was restless, wanted to walk and drive, which we permitted. Then râles appeared all over the second lung, there were coughing and temperature, which all cleared up after three weeks, but was followed by a pleural effusion in the compressed side. The patient gained twenty pounds in weight, and in November became so strong that we could not control him. He left us in December and went through Mexico in a big touring car. Only a year ago today his case was regarded as desperate.

A schoolgirl of seventeen had hemorrhages for two years. On April 24, 1910, Murphy, at the Mercy Hospital in Chicago, compressed the left lung. In two months the tubercle bacilli had disappeared. In January, 1911, her parents insisted upon her going home, bought a motor for her against our advice, and wrote us a few days ago that there was trouble in the second lung. In all we have had 6 cases where the results have been spoiled by not keeping up the treatment properly for a sufficient length of time and by overdoing.

Of the cases bilateral from the start, 2 left too soon, 1 has been delayed by a bad attack of bronchopneumonia in the second lung, and 1 was an experiment.

We have had 4 interesting cases in which we have compressed the lung that was last attacked. In these 4 cases the first lung had offered good resistance, so that the process dragged itself from point to point, healing as it went and leaving scars behind. When the second lung was attacked this power of resistance was lost, so that pneumonic processes drowned out the connective-tissue efforts at proliferation. The disease could not be checked, and cavities were formed. In these 4 cases we had to depend upon the functional capacity of the scarred lung while the second lung healed under compression.

In 1 case the second lung had a cavity as large as an egg in the second interspace. Rest and fresh air could not reduce the temperature. After six weeks' compression the temperature became normal. After six months the patient was riding horseback and doing well. Her strength made her restless and impatient of control. She left us all too soon, and the last we heard was not doing well.

The second case was of six years' standing, the first lung scarred throughout, the second wet down to the fourth rib in front and eighth behind. We compressed the second lung in November, 1911. At that time she had been seriously ill for months, was in bed, could digest very little, coughing, raising, temperature, etc. Today there is no trouble of any kind, no cough, no expectoration, no temperature, the patient is eating anything she likes, is

strong, and feels so well that it is difficult for her to realize that there is any need for caution.

The third case had both lungs affected three years ago. The right had a cavity under the clavicle, the left had râles down to the second space in front and fourth behind. After six months the patient felt so well that she went home, where she continued to improve until the summer of 1911, when she broke down under work. The right lung that was first attacked and the worst in 1909, was now in fairly good condition, while the left was full of râles and altered breath-sounds. Four months' rest in bed failed to dry out this lung and it was badly affected at each menstrual period. In March we began its compression, which was incomplete on account of adhesions, but sufficient to cause the disappearance of the râles, a much better heart action, and to greatly diminish the effect of menstruation.

The fourth case was a young man of twenty-four, 5 feet 8 inches in height, and weighing only 90 pounds in March, 1912, when he came to us for compression of the right lung, which contained three cavities that gave him no rest. The left lung was scarred through and through, and the right lung dripping wet. There were attacks of palpitation, irregular and intermittent heart action, pulse of 120, and suffocative crises, when the cyanosis was marked. On account of the weak cardiac muscle and because of the extensive scarring of the first lung, we were afraid to undertake the compression of the second lung. To our surprise, after the first forty-eight hours the heart action began to improve in a most gratifying way. After two weeks the cavities were well compressed, the constant strain of expectoration ceased, and there was nothing but a teaspoonful of thick sputum raised the first thing in the morning. Unfortunately, the pressure on the liver started a profuse and persistent discharge of bile, causing a bad diarrhea. We used as little pressure as possible, fed him only on what would be absorbed through the walls of the stomach, and the liver quieted down so that today the patient is eating well.

Of the 14 cases of partial compression 4 are dead, 1 is too soon to report, 8 are improving, and 1 was an experiment. Two deaths were due to intestinal tuberculosis, one to hemorrhage, and one to heart failure. It is probable that this last might have been avoided if we had realized the condition of the heart muscle, and the effect upon it of too much pressure. As this was only 5 cm. of water and much higher pressures are frequently well borne, we did not appreciate the danger until it was too late. The death from hemorrhage occurred before we could get the lung compressed. Profuse and frequent hemorrhages were the indications for the attempt. Of

the 8 cases improving, 3 could hardly have been alive today without help. In August, 1910, 1 case had an exudate up to the sixth rib behind and fourth in front; above this, loud bronchial breathing and coarse wet râles with marked dulness throughout. There were râles and altered breath-sounds on each side of the interlobar fissure in the second lung. This patient weighed 80 pounds, weak, no digestion, her history suggested an illness of four years' duration, during which she had not coughed, nor expectorated, nor had any temperature. We therefore regarded this as a typical interstitial case, purely extra-alveolar and extra-bronchial, and asked what effect pressure could have with no transbronchial drainage. As a result of the injections there was a sharp rise in temperature for twenty-four hours, but nothing else—no cough, no expectoration. On account of adhesions, there was a very imperfect collapse of the lung. We persisted for months, and today she has an indefinite lease of life, is working and comparatively well.

Another case had been ill for three years with a rectal fistula, casts, and albumin. Pleural adhesions and neoplasms made the production of a pleural cavity slow and difficult. When we began in November, 1910, the pleural surfaces were so adherent that we could get in only 50 c.c. of nitrogen at a time. Previously, for over a year, the daily temperature had varied from 100° to 102° F., but now, for over a year, there has been no temperature, the casts and albumin have disappeared, the rectal fistula is healed, she is gaining in weight and strength, and we have every reason to expect a complete recovery.

Another case is that of a prominent business man who came to us in June, 1911, with a bad left lung and râles in the apex of the right. In two weeks the temperature, which had been over 100° F. for six months, fell to normal. In two months cough and expectoration were gone. In March he left us, in spite of our remonstrances, feeling so well that he was contemptuously reckless of the risks he incurred in going back to ordinary life.

Of the 6 monolateral cases of complete compression, one has been supporting his family ever since the lung was compressed in 1910. The second had persistent temperature for over four months. Since the lung was compressed in June, 1911, there have been no cough, no expectoration, and no temperature. After two years' illness with frequent hemorrhages, she is apparently perfectly well. The third case was of the rapid pneumonic type, with high temperatures and persistent extensions of the process. A sister had died of tuberculosis within four months of the diagnosis. As six months' rest in bed availed nothing, we compressed the lung in May,

1911. There has been no temperature since, and today there is no cough, no expectoration, and the patient is doing well.

In June, 1911, a business man came to us with a history of bad attacks of caseous pneumonia for over a year. As he was sent to us for compression, we did not delay, but compressed the lung at once. Since then there have been no temperature, no cough, and no expectoration, excepting through a six weeks' attack of pleurisy which left an effusion.

The fifth case had slight hemorrhages, caseous pneumonia, and spitting of blood for over a year. Since the lung was compressed, with the exception of a bad cold, there has been nothing. He is making a good recovery.

The sixth case, after six months of compression, has gone back to work, looks well, feels well, and is keeping up the compression at home.

To sum up our two years' work: Of 31 cases of advanced, progressive, pulmonary tuberculosis, 3 are too recent to report, 6 are dead, 10 are uncertain, 10 are making good recoveries, and 2 have been well for over a year.

DISCUSSION ON PAPERS BY DRS. HAMMAN AND SLOAN AND DR. LAPHAM

The Chairman: There are relatively few here who have had experience in this matter. Dr. King will, I hope, speak to us for ten minutes.

Dr. H. M. King, Loomis, N. Y.: I think it is very delightful to listen to such enthusiasm as Dr. Lapham displays. I wish there were more who had had the same experience which she reports.

We began the employment of artificial pneumothorax in certain cases nearly a year ago. Since then we have attempted it in twelve cases. They were all "far advanced." Most of them might be considered hopeless. They were advanced cavity cases, with more or less profuse expectoration. Of the twelve cases, we have succeeded in producing a substantial compression of the lung in only two. In these two the results were somewhat spectacular. The other ten presented such adhesions as prevented any marked collapse or compression of the lung. In one case, a young man about eighteen years of age, the pneumothorax was attempted because of hemorrhages. We made four or five attempts at different times. At no time were we able to inject more than 400 c.c. of nitrogen. The pneumothorax was, consequently, very limited, and evidently confined to certain areas by apparently dense adhesions. Operation was beneficial. Hemorrhages ceased. The boy subsequently died, and at autopsy the absolute impossibility of producing any material compression of the lung was shown in the condition of the pleura.

To us who, perhaps, are more unfamiliar with the method, it does present certain dangers. In one case of ours, when the manometer indicated, by the fluctuation of its water column, that we were in the pleural sac, we passed 2000 c.c. of gas into a bronchus. This, of course, came promptly out through the mouth, and no harm resulted. It is quite conceivable, however, that danger might result from passing the needle through an adherent pleura into the lung and injecting even small amounts of gas. In another case we had a manometer reading which suggested that we were in the pleura. There was, however, no negative pressure. We cautiously introduced 500 c.c. of nitrogen with no apparent difficulty. Six hours later the patient developed mediastinal pain, and subsequently a subcutaneous emphysema beginning in the neck and spreading to the face and body, particularly on the side opposite the operation. The situation was embarrassing for twenty-four hours, and at one time alarming by reason of pressure on the trachea. With the subsidence of the emphysema, however, there was no further trouble.

Of the two cases which were successful, one was a long-standing case with the lesion confined chiefly to one lung. This man was pretty well generally, without fever but with profuse expectoration. He asked for the treatment because he had heard that it stopped cough and expectoration. With much doubt as to the possibility of producing any substantial pneumothorax, but yielding to his persistent request, we operated. To my surprise it was the most successful, and the only really successful, compression which we have been able to effect. The lung was apparently completely free; so after the first injection we had no difficulty in introducing 2000 c.c. at a time. Expectoration was reduced about 75 per cent. The man is doing very well indeed, and the injections are still continued at suitable intervals. The other spectacular case was, to start with, apparently hopeless. We succeeded in bringing about a considerable compression of the lung, and maintaining the compression, with immediate and lasting benefit to the patient. In this case an effusion filled the sac, making further injections unnecessary, and the patient is still doing well.

I believe artificial pneumothorax has a definite place in the treatment of pulmonary tuberculosis, although I am of the opinion that experience will teach that it is a procedure which must necessarily have a more or less limited field of application in these cases.

Dr. Edward R. Baldwin, Saranac Lake: My experience has been very recent. It covers perhaps twenty cases which I have not done myself. The first case was a man with very profuse hemorrhages. He did not live

long after the artificial pneumothorax, but I do not think death was hastened by it, for he was in partial collapse at the time. Since then we have had possibly twenty apparently hopeless cases. Only two have been free from fever. I am not prepared to make a detailed report. While we have had no serious accidents, there have been several cases of emphysema which were uncomfortable, and I know we have entered the lung in one or two cases where firm adhesions existed. There were at least seven cases in whom we were unable to get any gas in, or at least were fearful to attempt to force it in. It is very dangerous unless there is absolute evidence from a manometer that you are in the pleura to attempt to force it. We have tried to be on the safe side.

I regret that we have not introduced this treatment before. In some instances it is certainly of tremendous value to advanced cases. It seems to me that this method when perfected will be very useful to the specialist, especially in institutions where patients are doomed to a life of prolonged misery from cough and expectoration.

Incidentally, the question of mixed infection is an interesting one in connection with artificial pneumothorax. Fever which has been due to other infectious organisms than tubercle bacilli will certainly not be done away with by collapse of the lung if we are to judge by past experience. Pneumococcus infection will not—at least from any theory that I know of—disappear by collapse of the lung; and yet we have seen collapse of the lung take away fever of from 101° to 103° F. in a few days in patients having extensive cavities. It seems to me we would not expect this to occur in a mixed infection. I think my colleagues will agree with me that we do not see much mixed infection. We do see pure tuberculosis.

Dr. Sloan: In doing this work we rely solely on the manometer to tell us the location of the needle-point. Oscillations are studied carefully to note whether the point is in the pleural cavity, bronchus, lung, or in the subcutaneous tissue. On the initial introduction of the needle, inspiration and expiration are always negative, the manometer never going below zero if the needle is in the pleural cavity. With the introduction of gas expiration slowly becomes positive. Seldom do we get positive inspiration during first inflation. We do not believe it necessary. As a rule, we give 500 c.c. as initial amount, and at no time have we given 2500 c.c. Our maximum amount at any one time has been 1100 c.c. We must give the tissues time to readjust themselves and avoid the displacement of the mediastinum as much as possible.

The Chairman: Doctor, do you know the cubic contents of one lung cavity?

Dr. Sloan: We have never attempted to discover this, but I suppose it could be done by measuring all the withdrawn gas from around the completely collapsed lung.

To recapitulate, there are fifteen cases reported. In three we failed to produce pneumothorax on account of wide-spread adhesions. Two died early during treatment—one of tuberculous meningitis and the other simply died. One died four months after treatments were stopped. Nine are living today. Seven are continuing treatment. Six of these are doing remarkably well—could not ask for more. Out of these six cases four have pleural effusions. I was in hope some one would mention this complication in the discussion. The seventh might be doing better, but the difficulty is that after patients get back to their homes they take up their old habits and we cannot control them. My last word would be, if you engage in artificial pneumothorax work, "Know your manometer."

Dr. Lapham: We estimate the degree of compression chiefly by the use of the *x*-ray, but also by the physical signs. The extent of resonance gives a fair idea of the size of the pneumothorax. The breath-sounds suggest the condition of the lung. The first effect is the disappearance of râles. Then the breath-sounds become smoother and more distant and more suppressed. Later on they are metallic, like whistling over a key, and finally there is a metallic clinking sound, as of a drop falling into space. The *x*-ray gives the most reliable information.

RESTORATION OF WORKING EFFICIENCY AFTER SANATORIUM TREATMENT

By Herbert Maxon King, M.D.
Loomis, N. Y.

There has been a growing conviction on the part of those engaged in the care and treatment of tuberculous invalids that the immediate results of treatment, as evidenced by the apparent condition of the patient after a few months in the institution, are extremely unreliable, and that the term "cured" or even "apparently cured" as applied to these cases is scarcely justifiable. The unanimity of opinion on this point was shown in the action taken by the American Sanatorium Association at its meeting on May 29th, where, without a dissenting voice, it was decided to drop the terms "cured" and "apparently cured" altogether, substituting in their place the terms "arrested" and "apparently arrested," at the same time retaining the definition for the respective terms formerly used. In no sense must this be taken as evidence of pessimism on the part of physicians engaged in sanatorium practice. On the contrary, there has probably never been a more healthy optimism in regard to the treatment of tuberculosis than obtains today, but realizing, after many years of experience, that in spite of an apparent restoration to health a considerable percentage will inevitably relapse, and that therefore appearances gathered from physical signs and apparent general well-being cannot safely be assumed to mean that the patient has achieved a cure of his or her disease. Contrary to the first impression which one would gather from this action of the Sanatorium Association, the more conservative view of the situation on the part of physicians cannot fail to have a salutary effect upon patients at the time of their discharge from treatment. They will, especially the more intelligent among them, realize that in a sense they go out from treatment surrounded by limitations beyond which they can venture only at a serious risk no matter how well they may appear or feel. The mistake of overconfidence on the part both of the patient and physician as to the permanency of the apparent restoration to health is a common cause of relapse, and this mistake will

certainly be more easily avoided by a clear recognition of what is actually accomplished and not accomplished by a few months' treatment. What, then, may we reasonably and confidently expect from successful sanatorium treatment?

First of all, we may expect a quiescence of the activity of the disease; second, restoration, more or less complete, of physical and mental competency; and, third, restoration of self-supporting working efficiency. The permanency of these results can be determined only by the subsequent histories of patients after discharge from treatment and resumption of ordinary conditions of life and occupation. That such results can be accomplished more quickly and certainly under sanatorium conditions I believe emphatically, after ten years' experience in private and dispensary practice and ten years in sanatorium work, and I think all who have had a similar experience share my convictions. Unfortunately, we have not at the present time accurate data which permit comparison of methods. Consequently, statistical evidence is unavailable; but even if it were, and we could determine with mathematical certainty the percentage value in favor of sanatorium treatment, we would still have to face the present necessity for treating a large proportion of tuberculous invalids in their homes and at the dispensaries, and therefore, however desirable it might be theoretically that every case of tuberculosis be sent to an institution and kept there during the whole course of the disease from its incipiency to its termination by recovery or death, such a desideratum is quite out of the question at present and will probably remain so.

With a view of illustrating the uncertainty of apparent immediate results of treatment, I have made a preliminary and somewhat superficial statistical inquiry into the condition of patients discharged alive from Loomis Sanatorium during the years 1902–1905 inclusive, as determined by their status on October 31, 1911, or from six to nine years subsequent to discharge, an interval sufficient to justify in some measure an idea of the permanency of results. This inquiry, after eliminating the patients under treatment for a period of less than thirty days, those who died in the sanatorium, a few whose records for some reason were either lost or inadequately filled out, and those who could not be traced, leaves available for the present purpose 547 patients, 78 of whom were classed as incipient upon admission to the sanatorium. Of these 78 incipient cases 43, or 55.12 per cent., were discharged apparently cured, and of these 43 apparently cured cases 67.44 per cent. were found to have maintained satisfactory health and working efficiency on the date of the close of the investigation. Of the 78 cases of this

class, a total of 66.66 per cent. were found to have remained in satisfactory condition of health irrespective of condition on discharge; 19.23 per cent. have died, 5.12 per cent. were alive but in unsatisfactory health, while the status of 8.97 per cent. could not be determined on the date of the close of the investigation. Of the 43 cases discharged apparently cured, 16.27 per cent. have died, 6.97 per cent. had relapsed but were still living, and the status of 9.3 per cent. could not be determined. During this period there were 174 patients classified as moderately advanced upon admission. Of this class 49, or 28.15 per cent., were discharged apparently cured, and of these apparently cured cases 65.3 per cent. were found to have maintained satisfactory health and working efficiency at the close of the investigation; 6.12 per cent. had relapsed but were still alive, 16.32 per cent. had died, while the status of 12.24 per cent. could not be determined. The close similarity between the ultimate results of similar groups in the two classes, incipient and moderately advanced respectively, is rather striking. During this period there were 295 patients classified as far-advanced upon admission and at the close of the investigation 82.03 per cent. of this group were found to have died; only 10, or 3.38 per cent., were discharged apparently cured, and of these 10, 8, or 80 per cent. of the apparently cured cases, were found to have maintained satisfactory health and working efficiency during the interval of from six to nine years. Of the total 295 of this group of far-advanced cases 32, or 10.84 per cent., were found to have maintained satisfactory health and working efficiency at the close of the investigation.*

Bear in mind that methods of treatment have been modified presumably for the better, during the interval which has elapsed since the patients included in this inquiry were discharged from the sanatorium. It is almost certain that a patient's chances for restoration to working efficiency and for a permanent arrest of his disease are better today than was the case six to nine years ago. It may be a disappointment to those who have not familiarized themselves with the true situation that so large a percentage of our patients relapse after achieving what we formerly considered an apparent cure of their disease. Nevertheless, the facts when squarely faced cannot fail to encourage us and to stimulate still further effort in the struggle which we are making.

* For more detailed information with regard to this investigation see charts and analyses included in paper read before the Sociological Section entitled "A Preliminary Study of the Value of Sanatorium Treatment," p. 82.

A STUDY OF THE ULTIMATE RESULTS IN THE DISPENSARY TREATMENT OF TUBERCULOSIS

By H. R. M. Landis, M.D.
Philadelphia

Without the dispensary such control as we now have of the tuberculosis problem would have been hardly possible. Its importance in the tuberculosis crusade cannot be overestimated, and yet it is extremely difficult to establish in terms of cases with disease arrested just how efficient it really is. Compared with statistics dealing with sanatorium patients little has been done to show the ultimate results obtained in patients whose treatment was received entirely in a dispensary. When the tuberculosis dispensaries were first introduced it was hoped and believed that the majority of patients could be treated efficiently by these agencies. After a few years' trial, however, there was considerable disappointment with the results obtained, and with the increasing number of sanatoria more and more cases were at once sent to these institutions. Here again the results have not measured up to expectations, so that at present there is considerable uncertainty as how best to proceed.

In the mean time dispensary treatment itself has undergone many changes and in each instance for the better. The lesson has been learned that there is a limit to the number of cases which can be handled efficiently, supervision in the home has been made something more than a mere inspection visit, and, above all, there has come about a very general appreciation that there are economical and social aspects of the tuberculosis problem as well as medical.

It is particularly the economical and social aspects of the problem that have emphasized the need of redoubling our efforts along the line first attempted by the dispensary, namely, the handling of patients who offer a chance of being benefited in their homes. This involves the improvement, or the attempt at improvement, of living conditions, without which no very rapid improvement in the situation can be hoped for. From this standpoint the experiments about to be inaugurated in New York City and Cincinnati,

whereby the problem is attacked as a family problem in the home, will be watched with the keenest interest.

In presenting the results detailed in this paper it should be borne in mind that they represent the dispensary as it was in its incipient state. Furthermore, the Phipps Institute dispensary, at the time of its foundation, was the only place of its kind in eastern Pennsylvania, and to it flocked patients from all over the city of Philadelphia, the adjoining towns, and even the neighboring State of New Jersey. Of necessity, supervision was impossible in many instances, and even where practised it was inadequate as we understand supervision today.

The patients under consideration visited the Phipps Institute in the second year of its existence, namely, from February 1, 1904, to February 1, 1905. The investigation was completed September 1, 1911, so that an interval of nearly seven years had elapsed. Any one who has not attempted an investigation of this sort can hardly appreciate the difficulties encountered in such a study. The long interval which had elapsed, and the constant shifting of their abode on the part of many of the patients, made the obtaining of information a slow and tedious process. One of the gratifying results, however, was the receiving of many letters which indicated that the instructions received had been productive of good.

The total number of patients applying to the Institute in the year under consideration was 1067. They have been divided into four groups: First, those known to be dead; second, those untraced; third, those refused treatment, either because of being non-tuberculous or not destitute; and fourth, those known to be living. The information was obtained from the records of the Institute, the official death records at the City Hall, from letters, and from the investigations of a nurse.

First. *Those known to be dead.* Of the 915 cases with a positive diagnosis of tuberculosis, 380 (41.5 per cent.) are known to have died of tuberculosis. In addition there are 31 cases having a diagnosis of tuberculosis on the records of the Institute who, according to the official death returns, are reported as having died of other causes. In a few cases, as, for instance, several deaths from violence, the returns are correct. Not less than 23 of this group, however, in all probability died of tuberculosis, particularly 11 officially returned as heart disease. While there is a certain amount of confusion between tuberculosis and certain forms of heart disease, particularly mitral stenosis, the mistake is usually that of considering a heart case as being tuberculous rather than the reverse.

Table No. 1 shows the number of deaths for the seven years:

TABLE NO. 1

NUMBER OF PATIENTS KNOWN TO BE DEAD, DIVIDED ACCORDING TO YEAR OF DEATH AND SOURCE OF INFORMATION

	1904	1905	1906	1907	1908	1909	1910	1911
Official report	20	37	19	10	4	12	8	0
Phipps report	82	40	5	4	1	0	2	0
Investigation	5	23	9	9	7	7	3	1
Letters	4	16	12	4	1	0	7	4
Total	111	116	45	27	13	19	20	5

No date specified in 24.

Second. *The untraced.* In this group there are 320 cases. This large number, comprising 34.9 per cent. of the cases treated as having tuberculosis, serves to emphasize the necessity of limiting the territory covered by the dispensary. As I have already stated, the conditions which existed when the Institute was founded made it an impossibility to keep closely in touch with the patients, and this applies more particularly to those living in the overcrowded sections of the city where the population is constantly shifting from house to house. Another defect in attempting to cover too great an area is the failure of patients to keep up their attendance. The tremendous falling off of attendance after a few months is well illustrated by the figures in Table No. 2:

TABLE NO. 2

NUMBER OF PATIENTS ATTENDING THE PHIPPS INSTITUTE IN 1904 WHO ATTENDED IN SUCCEEDING YEARS

February, 1905	274
" 1906	165
" 1907	31
" 1908	14
" 1909	15
" 1910	13
" 1911	9

Thus, of 915 patients with a definite diagnosis of tuberculosis, but 274 attended the following year and this number rapidly diminished each succeeding year.

Third. *Those considered as not having tuberculosis or as not being destitute.* There were 152 cases in this group, and the only interest in this connection is that of diagnosis. In the majority of these 152 cases the histories show that there was nothing to warrant a diagnosis of tuberculosis, or if tuberculous, they were not destitute. There were, however, 14 in which a diagnosis of acute or chronic bronchitis or asthma was made. While no special study was made of these cases, it is known that several of them have since died of tuberculosis. More recently one of my associates, Dr. Cruice,

has investigated a number of patients who visited the dispensary five years ago, and in whom a diagnosis of bronchitis or asthma had been made from one examination only. Of 50 such patients from whom he was able to obtain definite information, either by letter or personal examination, 4 have since died of tuberculosis and 23 have definite symptoms and physical signs of the disease at the present time.

These results serve to emphasize the necessity of more care, especially as there is a growing tendency to more and more restrict the diagnosis.

Fourth. *Those living.* At the time the investigation was completed (September 1, 1911), 184 patients (20 per cent.) were known to be living. According to the classification first in use at the Institute the prognosis was estimated in the following terms: favorable, doubtful, and unfavorable. This classification is essentially the same as incipient, moderately advanced, and advanced.

The following tables are based on the prognosis used at the Institute:

TABLE NO. 3

NUMBER OF PATIENTS LIVING, DIVIDED ACCORDING TO PROGNOSIS

Prognosis:	Favorable	121	184 out of 1067 cases.
	Doubtful	34	
	Unfavorable	5	
	No record	24	

In reply to the question of whether they had remained free from symptoms, the following results were obtained:

TABLE NO. 4

NUMBER OF PATIENTS LIVING AND EXHIBITING NO SYMPTOMS OF TUBERCULOSIS, DIVIDED ACCORDING TO PROGNOSIS

No symptoms:	Favorable	80	102 out of 184 cases.
	Doubtful	19	
	Unfavorable	3	

TABLE NO. 5

NUMBER OF PATIENTS LIVING BUT EXHIBITING SYMPTOMS OF TUBERCULOSIS, DIVIDED ACCORDING TO PROGNOSIS

Having symptoms:	Favorable	18	36 out of 184 cases.
	Doubtful	16	
	Unfavorable	2	

In addition there were 24 who were living but who gave no information as to their health or occupation.

Answers regarding the character of their occupation were obtained from 107 patients. As would have been expected, the great majority of those

able to work belonged to the favorable or incipient group. This is shown in the following tables:

TABLE NO. 6

NUMBER OF PATIENTS AT WORK, DIVIDED ACCORDING TO PROGNOSIS

At work:	Favorable	82	107 out of 184 cases.
	Doubtful	22	
	Unfavorable	3	

TABLE NO. 7

NUMBER OF PATIENTS LIVING BUT NOT AT WORK, DIVIDED ACCORDING TO PROGNOSIS

Not working:	Favorable	8	15 out of 184 cases.
	Doubtful	5	
	Unfavorable	2	

Of the 107 patients giving definite information regarding their occupation, the following facts were elicited: Forty-five different lines of work are being followed at present. It is interesting to note that 95 of the 107 are engaged in occupations involving inside employment and that 12 only are working at outside jobs. Furthermore, there were but nine instances in which patients changed from an inside to an outside occupation, while two others changed from outside to inside employment. The character of the work is extremely diversified, ranging from sedentary confining clerical work to unskilled laboring work.

TABLE NO. 8

CHARACTER OF EMPLOYMENT OF PATIENTS IN 1911, TOGETHER WITH THE OCCUPATIONS PURSUED BY THEM IN 1904

1911		1904	
Bookkeeper	1	Tailor	1
Bricklayer	2	Unknown	2
Carpenter	1	Unknown	1
Child's nurse	1	Housework	1
Clerk	9	School	4
		Salesgirl	1
		Fruit vendor	1
		Dental student	1
		Clerk	2
Car conductor	3	Machine operator	1
		Baker	1
		Tailor	1
Cook	1	Unknown	1
Coremaker	1	Iron moulder	1
Dancing teacher	1	Dancing teacher	1
Dentist	1	Machinist	1
Doctor	1	Teacher	1
Driver	3	Shoe cutter	1
		Laborer	1
		Driver	1
Carried forward	25	Carried forward	25

TABLE NO. 8.—CHARACTER OF EMPLOYMENT OF PATIENTS IN 1911, TOGETHER WITH THE OCCUPATIONS PURSUED BY THEM IN 1904.—(*Continued.*)

1911		1904	
Brought forward...	25	Brought forward...	25
Electrician	1	Unknown	1
Farmer	2	Teamster	1
		Tailor	1
Glassworker	1	Glassworker	1
Grocer	2	Unknown	1
		School	1
Housepainter	2	Housepainter	1
		Office clerk	1
Housework	39	Millhand	2
		School	1
		Housework	36
Iron moulder	1	Iron moulder	1
Insurance collector	1	Coal miner	1
Laborer	2	Laborer	2
Leatherworker	1	School	1
Millhand	3	Millhand	3
Musician	1	School	1
Orderly	1	Packer	1
Outdoor work	1	Weaver	1
Plasterer	1	Threader	1
Photographer	1	School	1
Policeman	1	Lithographer	1
Printer	1	Unknown	1
Riveter	1	Riveter	1
Saleswoman	1	Saleswoman	1
Scrubwoman	1	Waitress	1
Seamstress	2	Seamstress	2
Shipper	1	School	1
Salvation Army Officer	1	Salvation Army Officer	1
Storekeeper	1	Peddler	1
Student (medical)	1	School	1
Supt. of sanatorium	1	Motorman	1
Tailor	3	Tailor	3
Tooth-moulder	1	Tooth-moulder	1
Typefoundry	2	Typefoundry	2
Typist	1	Typist	1
Unknown	1	Baker	1
Waiter	1	Waiter	1
Weaver	1	School	1
Total	107	Total	107

The question naturally arises: "Can we be sure that these cases were all tuberculous?" So far as the actual finding of tubercle bacilli is concerned, the evidence is not strong. Of the 107 now known to be earning their living, the sputum was positive in 9; negative in 47, and no examination recorded in 49. On the other hand, an analysis of the histories of these cases shows that in many of them there was exposure to the disease and that in all there was one or more than one strongly suggestive symptom, such as blood-

spitting, pleurisy, night-sweats, cough, loss of weight, etc. In addition, physical signs indicating more or less involvement of one or both apices were present in all. Of course, it cannot be denied that some of these cases represent instances of quiescent or completely healed lesions.

In the light of our present knowledge, however, there is no method by which we can accurately distinguish between a completely healed lesion and one which is quiescent, but apt at any time to become active. So long as this difficulty confronts us the safer course is, at any rate so far as the dispensary patient is concerned, to explain the situation and do what we can toward educating the patient. As Bulstrode has well expressed it: "Skepticism, based upon the absence of bacilli in the sputum, raises the further question as to the means by which phthisis was diagnosed in pre-bacillary days, or as to how it is practicable to diagnosis any 'closed' tuberculous lesion. It is, of course, possible to raise the question as to whether any case in which tubercle bacilli have not been discoverable in the sputum can be regarded as one of pulmonary tuberculosis; but, conversely, it would be a very serious position to take up to urge that no patients whose sputum had not yielded tubercle bacilli should be admitted to a sanatorium. It might, indeed, be regarded as a fatal objection from a curative and consequently from a preventive standpoint.

"It will probably be generally conceded that by the time tubercle bacilli have appeared in the sputum some breaking down of lung substance has already commenced, and that if it is practicable to diagnose the presence of the disease with a fair degree of probability before the appearance of the tubercle bacilli in the sputum, much valuable time may be gained."

In spite of the innumerable articles which have been written urging the importance of certain symptoms or combination of symptoms as strong evidence of tuberculosis, past or present, there still exists too much timidity in making a diagnosis. Involving, as it does, such serious consequences, if an error is made it is safer in this instance to be radical rather than conservative, even if it has been offered in defense of the conservative attitude that we have no right, as was recently said, to place the stigma of tuberculosis on an individual unless we are practically certain that such a condition exists. Certainly any one who has seen much of tuberculosis must have been impressed repeatedly with the unfortunate results of conservatism whereby the diagnosis has been delayed until it is impossible to any longer have any doubt.

DISCUSSION ON PAPERS BY DR. KING AND DR. LANDIS

Dr. W. Jarvis Barlow, Los Angeles: In giving the facts in regard to Dr. King's paper, the working efficiency after sanatorium treatment, I do not think we can lay too much stress upon the point of the effect that sanatorium treatment has on these patients. We lose sight of one feature, and that is the educational feature, which is so largely dependent on what they learn at the sanatorium. Let us take simply the arrested cases. I do not think it is only in them we find the greatest benefit to the tuberculosis problem. To me the greatest benefit is from the education which these patients give to other people's families and friends when they leave the sanatorium. The statistics we have in California I feel go a little higher than those that Dr. King has presented here, especially with regard to the far-advanced cases. Although I have not the statistics with me, I know our far-advanced cases in six years range from 15 to 20 per cent. of keeping in an arrested condition and of keeping well. For the last four years we have avoided discharging apparently cured cases. We have put them in the arrested class. The new name suggested, "apparent arrest," is one I shall adopt as soon as I go back, as I like it better than "arrested" cases, although we have put them in the arrested class and do not now discharge apparently cured cases. The far-advanced cases have been in an arrested condition for the last five or six years, and in the early stages they are apparently cured after two years.

In regard to the dispensary work, I am sorry to say that our statistics there are not well kept, so that I cannot discuss intelligently Dr. Landis' paper. In our dispensaries, on account of the economical question, the statistics are not properly looked after in keeping track of the patients in a way which Dr. Landis has so ably presented.

In regard to the moderately advanced cases, I want to say that these are the cases we receive mostly from the industrial classes, because we chose from our waiting list the better class of cases. The incipient cases do not apply; therefore, we get chiefly the moderately advanced cases. Of these we have tried to keep track for the last eight years of the ones discharged, and they run from 50 to 60 per cent. of those arrested that keep at work. That is to say, we have tried to see they have gotten proper work after leaving the institution. We keep them there until we know where they are going and under what conditions they are to live and to work. If their conditions are not proper, we keep them six months longer until we find some philanthropic person to put them in the proper condition. That is the reason the percen-

tage is as high as 50 to 60 per cent. of keeping at work the moderately advanced cases. The far-advanced cases have relapsed, and I cannot report more than 15 to 20 per cent. of the far-advanced cases who have kept at work for four or five years.

Dr. Charles O. Probst, Columbus, O.: I am somewhat familiar with the dispensary in our city. I have no records to give, not having expected to take part in this discussion. One of the things we aim to do with the dispensary is to make it a means of getting into the homes and of bringing children to the dispensary. We have some 600 cases on our visiting list, of which now about 100 are children presenting the minor forms of tuberculosis. We do not expect to cure many of our dispensary patients, and we have taken that position with the public from the beginning. Our main object is to get into the homes of the people for the purpose of instruction, and especially to bring the children to the clinic so that we can get hold of them in a curable stage.

Dr. Lawrason Brown, Saranac Lake: I may say, I am skeptical as to the value of the immediate results among patients discharged from the sanatorium, and it was that which led me to suggest a change in the nomenclature which we have employed concerning these patients. I have felt for a long time that we had to divide sharply between the two classes of reports upon patients—first, the immediate results, and second, the ultimate results. The ultimate results are, I believe, the only facts that are going to prove the truth of whether or not the disease is curable—so curable as some of the gentlemen have indicated in the various discussions here. There are a number of things which influence the permanent results. I believe it is unfair almost to compare the differences in the results of the dispensary and sanatorium treatment on account of the financial status of the patients, and the financial status has as tremendous influence upon the ultimate results of treatment. The conditions at home and the intelligence of the family play a very important part in it, and, of course, in dealing with the financial condition it is very essential to know whether the patient is a member of the family or the head of the family. All these points come into play and influence the ultimate results very largely.

The only three divisions of ultimate results which are of any value, so far as I can see, are, first, whether the patient is alive; second, whether he is dead; and third, whether or not you can trace him.

The question of economic cure is interesting to the sociologist. A man can work until he is tottering on the brink of the grave, and he tells you precious little about his condition when he says whether or not he is working.

The results we have obtained at the Adirondack Sanatorium from 1884 up to 1911 show that we have had 3000 patients. Of this number we have been unable to trace 7 per cent. Of the remainder, 51 per cent. are living and 43 per cent. are dead. Those are figures which no one can dispute.

The Chairman: Any one who has listened to these discussions must realize that the tuberculosis problem has two very distinct phases, and that tuberculosis among the middle classes or the well-to-do is a very different thing and needs to be very differently handled from tuberculosis among the very poor.

We have with us a gentleman who has had much experience with the disease among the poor, and we should like to hear from him.

Dr. Leopold Rosenberg, Bedford Hills, N. Y.: I am very sorry, Mr. Chairman, I can add absolutely nothing to the discussion because we are unable to get post-discharge records of our patients, excepting a few indefinite ones. We deal with a double problem, not only of ill health, but extreme poverty, and are seriously handicapped in our endeavors to have patients hold the state of health which they get at the sanatorium. Many of our patients cannot speak the English language, many of them return to the sweat-shops, and many of them have relapses. In this way it is impossible to get the coöperation of the patients regarding their post-discharge history. Quite recently the lay board has established a paid investigator who is to look into this matter. I venture to say that the ultimate results are not very gratifying, because of the untoward circumstances mentioned. It is not the fault of sanatorium treatment: it is an economic problem.

Dr. Isadore Kaufman, Philadelphia: I am associated with Dr. Landis in this work in Philadelphia, and we come in intimate contact with many patients, particularly those engaged in industrial occupations.

There is one point that Dr. Landis' paper brings out, and I think it well worth mentioning, particularly for the benefit of sanatorium physicians, for we have quite a number of patients who go to one of the industrial sanatoria, and these patients—arrested cases—are invariably sent home with the advice not to go back to their old positions in the factories. The point is that very few occupations should be changed. The figures given by Dr. Landis show that a large majority of those patients who have kept well are those who have returned to the "indoor jobs," and, it seems to me, when we have traced social conditions in the large cities, where people normally are making small wages and living under poor conditions, we ought not to recommend new positions for them. It means they have to go into a line

of work they are not accustomed to and accept even lower wages, necessarily causing them to live under worse hygienic and dietetic conditions.

Dr. W. W. Tompkins, Charleston, W. Va.: I would like to know what you mean by incipient stage. I think there is a good deal of looseness in that term. I would like to know, for instance, when we speak of the incipient stage, how much temperature patients run, how much they have in the way of expectoration, how much there is in loss of weight, and how the pulse is running. I think some physicians will make a diagnosis almost when the patient has no symptoms. When we get these favorable incipient cases of this sort and put them in a sanatorium or treat them ourselves, they are likely to get well. In this connection I want to relate the story of two brothers who were charged with having committed a crime. They were placed in jail. One of them was thought to have incipient tuberculosis, and in the other the disease was thought to be further advanced. The one in whom the disease was considered a little further advanced was pardoned and allowed to go to a certain sanatorium, while the other brother remained in jail. In six months the sanatorium patient was brought home dead. The other came out of jail a well man, was acquitted of the crime, and has remained well since. I could not say that leaving one in jail was a good thing, or that sending the other to a sanatorium was a disadvantage. Is it not probable that some of these cases simply have a predisposition to tuberculosis and are diagnosed incorrectly, and that a faulty diagnosis is often the case in which we get the most brilliant results?

Dr. Jay Perkins, Providence, R. I.: I would like to call attention to one thing Dr. Brown mentioned, and that is that the results of sanatorium efficiency depend to a large extent on the environment of the person after he leaves the sanatorium and the care which he receives. I do not think it is fair for the sanatorium to claim all the good effects of the treatment when a person is kept there for but a few months and then comes under the care of Dr. Landis or some one else in the dispensary.

To cite an extreme case, I have under observation a man who left a sanatorium several years ago as incurable. He was discharged for that reason. He was in a day camp for the summer. We had him under observation the next winter, and then in the day camp the next summer; we then allowed him to go to work driving a coal-team for his brother. I saw his daughter a few days ago and inquired about her father, and she said he was working steadily now, not only driving a coal-team, but handling coal. That case is down on the record of efficiency of the sanatorium because the

man was treated at a sanatorium. I do not believe the statistics of these cases are any more reliable than most other statistics.

I was exceedingly well pleased to hear Dr. Landis' paper in connection with dispensary work, because he is working under conditions where he can follow these patients up, a thing which most of us cannot do in our dispensaries. The dispensary is largely a clearing-house. We cannot give any good statistics. We take patients before they go to a sanatorium or to a hospital; we take them after they come back. It is impossible to give statistics in regard to what we are doing. We can observe the results by having nurses follow the cases up to their homes, and in keeping track of them, and we are accomplishing a good deal in helping patients to economic efficiency.

Dr. Wallace J. Durel, New Orleans, La.: The question of sanatorium and clinic patients from my point of view and experience is dependent largely upon the attending physician. Our chairman, in an essay last year, told us how important was the relation between the patient and the physician. I believe that in the after-results of treatment a good deal depends upon the influence of the physician on the patient. I say this from my own experience, for the great majority of patients who were discharged as apparently arrested, and who were careful in their post-treatment, remained arrested, while 60 per cent. of those who were careless and uncontrollable relapsed after a few years. This is a fact that we should remember, because a patient having left for home with doubt as to his exact condition, and not properly coached, will drift along to relapse, regardless of what you may have told him offhand unless he can be kept under observation and impressed with the fact that the post-treatment is as important as the treatment of actual lesions.

Regarding the relation of the sanatorium and the clinic patient, results are dependent upon the facilities of the patient for proper treatment at home, and also upon the willingness and intelligence of the individual patient.

I can best compare the sanatorium and the clinic patient to the boarding-school and the extern student. If a boy is willing and is studious at home, he can advance in the ordinary day-school; but if he is unwilling and disobedient, the place for him is in the boarding-school, where he will be carefully watched and made to do things the right way. The same we must do with our tuberculosis patients. The intelligent and obedient and well-provided patient can be treated in the clinic or office with good results; but

the ill-housed, ill-provided, and unwilling patient must be placed in a sanatorium, where he will be ruled with a firm hand and made to do things.

Dr. Alfred Meyer, New York: I think it might be well to touch on one point that has not been referred to in this meeting before, and that is, in view of the lack of such good results as we all desire from hospital care, sanatorium care, tuberculosis clinic care, or from the development of sociologic activities in our great centers, whether the time has not come to make a practical beginning with the idea that was advanced years ago, and about which very little has been done, and that would mean the establishment of industrial colonies as annexes to existing sanatoria, at least for the arrested and apparently cured. I advocated such a step in a paper recently read at the Third Municipal Conference of the New York City Charities and Correction. It seems to me it would be possible, if some active men would get together, to go to Albany and begin agitation there, as was done some years ago before the institution at Ray Brook was started, to urge the New York State Government to establish a farming colony as an annex to that State institution. If the State sets an example, or if, after independent study, the State does not allow the municipal authorities in the city of New York to undertake a similar step for a municipal institution, then what has happened in governmental and philanthropic matters heretofore can occur again, namely, a few private citizens can get together and establish such industrial and possibly farming colonies.

Dr. King's institution at Liberty, or the institution with which I have the honor to be connected at Bedford, or Dr. Trudeau's institution at Saranac Lake, or any one of these three private institutions, through their existing boards that have shown ability and talent, might set an example. It seems to me that a few private citizens, who take the initiative in so many good things, might set an example, and establish industrial and farming colonies as annexes to *existing* institutions, rather than begin them as an independent movement. Massachusetts has led the way in the establishment of a State sanatorium, and I should like to see New York State be the first to make a practical demonstration of the value of the industrial annex idea. I will point to an instance where there has been a fair success in the establishment of an industrial colony that has existed for twenty years, founded under the auspices of Baron de Hirsch, at Woodbine, N. J. The people who inhabit the colony are Russian immigrants who had been driven from their homes by religious persecution. Baron de Hirsch bought 2000 acres and in twenty years developed a fairly successful colony with 3000 souls, under hygienic conditions, where they manufacture machinery,

clothing, sweaters, and other things. These people are not tuberculous. Here there are 3000 people, most of whom came to this country handicapped in other ways,—first, driven away from home on account of religious persecution; second, settling in a strange land and unfamiliar with the English language; and third, unfamiliar with the habits and customs of the country, —and still they are leading lives which permit the rational pursuit of health and happiness under conditions which would not have been possible when a wilderness was opened up to them. Of course, this comparison is not a perfect one,—no comparison is,—but it is at least suggestive.

Dr. H. L. Barnes, Wallum Lake, R. I.: In regard to the farm colony proposition, Mr. Rowland G. Hazard, one of the trustees of the Rhode Island State Sanatorium, after observing some of the farm colonies in England, became impressed with their importance. He proposed to take a farm property in the southern part of the State for a colony and admit some of our ex-patients who were trained in farm work, as all of our patients are, during the summer months. I called the men patients together and put the proposition up to them. I explained it as carefully as I could, and I tried to convey to them as much enthusiasm as I could, and what I said met with a dead silence. From what experience they had had in connection with farming—it must have been my fault—they had all come to the conclusion that it was not farming they wanted. I am not an Egyptian taskmaster. I began patients with twenty minutes' work in the garden, and then increased it to thirty, forty, and an hour, and made the maximum an hour and a half to those whom I thought were able to do that much. It is not easy to interest mill operatives in a farm colony.

In regard to the return of patients to their own work, I do not believe we should make sweeping statements to patients that they should all go back to their old work, or that all patients should find new work. I think each case should be decided by itself. In Rhode Island we have a great many tool-shops and machine-shops, notably Brown and Sharpe, and a great many of these positions necessitate the inhalation of metal dust, which is injurious. We have many jewelry shops, and some of these are of the same character. To make the sweeping statement that all these people should go back to their old work would be a mistake. There are, at least, 15 per cent. of our men who have been inhaling metal dust.

In regard to the statistics of after-results of over 1300 patients treated during the last seven years in the Rhode Island State Sanatorium, we have been able to trace 99 per cent. Of that number there are 53 per cent. who are living, with 42 per cent. that are able to work full time. While I agree

with Dr. Brown that the mere fact of working is not in itself conclusive, yet I think it tells us something worth recording.

Dr. William Charles White, Pittsburgh: Three years ago we started a farm colony on the basis that Dr. Meyer has described as an attachment or annex to the city institution in dealing with the poor. That farm colony has been running now over three years. It has one advantage, I think, of providing for three or four months' longer care of patients. I think it cannot be utilized at all as a means of teaching patients the adaptability to new work which they will use later on, but it makes provision for the longer care of patients, and the patients paying what they can in the institution in town pay the same rate at the farm. It makes no difference what kind of work they contract to do at the farm, they pay their maintenance way, if they are able to do so, just the same as they would in the town institution. The work is a therapeutic agent not for their tuberculosis, but for their resistance to work. It is necessary, however, to make provision for running the farm outside of the patients' labor. I do not think it is possible to make the slightest success out of a farm that is run on the labor of patients; but, having made provision for the running of the farm outside of the patients' labor, the patients' labor contributes in part to the maintenance and upkeep of the farm. They fail you with the labor when you most need them. We have provided milk and eggs from this farm for the sanatorium, and in particular for the dispensaries and the babies' dispensary, which we have taken up as a new branch of community work. The farm is an exceedingly useful adjunct to the municipal management of tuberculosis.

Dr. A. M. Forster, Colorado Springs: I am afraid I have no right to talk on this question, as I am no longer connected with Eudowood, but I do not see Dr. Sloan, who at present has charge of the Eudowood colony.

Most of the gentlemen who have discussed the farm colony idea during the past two or three years have condemned it on theoretic grounds.

In two instances, however, the idea has been put into practice, and in each instance has been highly successful.

Dr. White has already testified to the success of his colony at Pittsburg, and I am sure he feels that the farm colony is a necessary and important factor in the comprehensive scheme he has inaugurated. Dr. White said that he did not feel that success was possible where the labor of patients was depended on entirely. During the four years I had charge of the Eudowood colony we only had two employees on the farm who did not have tuberculosis. They were employed originally because we did not feel justified in having the patients we had at that time do the heavy work, such as plowing,

etc. But at the time I left Eudowood there were several former patients who were capable of doing any of the heavy work.

As I said in discussing Dr. Vogeler's paper in the Sociological Section, if those gentlemen who are sufficiently interested to discuss the question would only take the time to visit the colonies of Dr. White or Dr. Sloan, I am sure they would be well repaid for the effort.

Dr. Henry S. Goodall, Lake Kuskequa, N. Y.: In regard to the farm colony business: The management of Stony Wold Sanatorium has made a constant effort, during the past ten years, to start a farm colony. We have never found anybody who would finance that movement, so that we have never been able to start such a colony. But four years ago rather we found people who were willing to finance the beginning of an industrial colony. Our idea is to take a whole family, one or more of whose members are convalescing or arrested cases of tuberculosis, and give employment to the members of the family in good health, and allow those who are more or less tuberculous to get gradually better and better, and as they become more and more able to work, to furnish them with light work at first, and gradually increase the work along lines for which they seem to be best fitted, and keep them up where they have means of earning a livelihood at some occupation suitable for their particular personality and their particular needs. I believe an industrial colony along these lines would be very useful, but just how much extra financing it would take to make it pay is a large question. In a colony like that we could take many who had previously been employed in occupations that were very dusty or wholly undesirable, and teach them some other occupation, so that they could adopt a healthier occupation without sacrificing very much in the way of remuneration. This idea we have started, and while we have not done very much as yet, what we have done has been successful.

I agree with Dr. Barnes that it is wrong to tell all people that they ought to go back to their old occupation, but I do think, take the rank and file of sanatorium patients, that the majority of them will do better to go back to their old occupations, or something similar, than to take up something which is brand new. At the same time, many of these people, if they keep their eyes open, will find some under better conditions than before.

Dr. M. F. Sloan, Towson, Md.: Dr. Forster's remarks would lead you to think that I am not interested in the farm colony. I am not the expert farmer that he is, but so thoroughly do I approve of the "colony" as a means of treating the tuberculous that I believe those institutions that have no colony are incomplete. It is the best place for those who have passed

through the sanatorium or advanced hospital and who desire to know their exact power of endurance before returning to their homes. I have noticed that those who have lived and worked at our colony for a period of from two to four months do not have to spend time looking for "light outdoor work" when they return to the city. The colony requires a lot of thought and attention on the part of the medical officer, and unless he is willing to devote that time, it will be a failure both therapeutically and financially. The novelty will cause some patients to work too hard or too long; others will shirk; in their inexperience some will do damage to truck, etc. There will be times when a sufficient number cannot be procured to carry on the work. To insure a constant working force to meet all emergencies and to do the more arduous tasks we keep a small force of employes. Some of these are former patients. The Eudowood Sanatorium Farm Colony was given a gold medal at the International Congress on Tuberculosis in 1908. It was doing a good work then and is doing it now. Last year twenty-two patients lived there at different times. The farm furnished us with milk, poultry, eggs, and vegetables, and after all bills were paid, a profit of three hundred and forty-five dollars was realized.

Dr. H. R. M. Landis, Philadelphia: I would like to say a word, first, about the employment of patients. I do not think, nor do I believe, any one who advocates that patients return to their original or old work, recommends them to undertake work that is of an undesirable nature. It may be undesirable because of irritating dust or because the hours are too long or the wages too poor. I think, as a rule, the majority of patients had better do the work with which they are most familiar. I do not believe that the dispensary will ever do the work that it should do unless it is capable of keeping in close touch with the patients, and where they move out of a large city there ought to be sufficient dispensaries so that a patient in moving from one to another can be traced; if a patient moves into another neighborhood, notification should be sent by the dispensary to which he originally went. Unless you have a limited number of cases to deal with, that is almost impossible. A patient after leaving the sanatorium should report at stated intervals to a dispensary, but this is not done, as a rule.

PREVENTION OF HEMORRHAGE IN PULMONARY TUBERCULOSIS BY THE ADMINISTRATION OF AUTOGENOUS VACCINE*

By Roswell T. Pettit, M.D.
Ottawa, Ill.

Walsh[1] divides the pathologic conditions responsible for hemorrhage from the lungs into three classes: (1) Active congestion of inflammation; (2) passive congestion of heart insufficiency, and (3) rupture of vessels. The first and third conditions are concerned in the production of hemorrhage in pulmonary tuberculosis.

Minor[2] says early hemorrhages are always venous; in the later stages hemorrhages arise from both the arteries and the veins. The connective tissue of the adventitia is more resistant to dissolution than the surrounding pulmonary tissue, and the vessels stand out in the walls of cavities unsupported; on these unsupported vessels aneurysms develop and hemorrhage results, with a weakening of the walls of the aneurysm and any slight rise in blood-pressure.

The immediate causes of hemorrhage given by various authors are overexercise, straining at stool, blows on the chest-wall, excitement, worry, season, climate, etc.T hat overexertion, resulting in a rise in blood-pressure, is an important factor cannot be disputed. Smith[3] finds no grouping or correlation with humidity and barometric pressure. The systemic plethora of the premenstrual period and vicarious menstruation may be rare causes. As predisposing causes, overfeeding, sex, heredity, and age are contributing factors.

Mixed infection as a causal agent in the production of hemorrhage in pulmonary tuberculosis has not received a great deal of attention, but Flick concludes, from bacteriological studies made by Ravenel,[4] Irwin, and himself, that the pneumococcus is an important agent in the production of hemorrhage.

Montgomery[5] reports an epidemic of hemorrhage among his cases, one-

* Work done under the Max Pam Research Fund.

third of 135 cases having hemorrhages within a few weeks. He believes this epidemic was due to an acute infection because of the grouping of the cases, and the toxemia, pain, and fever accompanying the hemorrhage.

Mixed infection is undoubtedly an important factor in pulmonary tuberculosis, and Prudden[6] has shown experimentally that pyogenic cocci are more active in tissue destruction than the tubercle bacillus, in a majority of cases. Is it not possible that, through this tissue destruction, hemorrhage results, and that, by checking the invasion of pyogenic organisms by the administration of autogenous vaccines, hemorrhages can be prevented? In a report published in the Journal of the American Medical Association December 24, 1910, I compared the percentage of hemorrhages in 21 cases receiving autogenous vaccines with the percentage of hemorrhages occurring in 60 cases under exactly the same conditions not receiving vaccines. It was found at that time that the percentage of hemorrhage in cases receiving vaccines was one-third of that in cases not receiving them. The conditions of housing, exercise, diet, medical supervision, climate, season, etc., were the same in both groups. The suggestion was made that hemorrhage, being due to the weakening of blood-vessels resulting from tissue dissolution, and tissue dissolution being in part, at least, due to the action of the secondary infection, the antibody production due to the administration of autogenous vaccines may have been sufficient to inhibit the further invasion of these organisms and thus to have prevented hemorrhage. Since that time a much larger number of cases have been studied, and the differences in the group receiving and the group not receiving autogenous vaccines is even more striking. The study of these larger groups of cases is the basis of this report.

The work of Wright[7] and others has shown that injections of killed and attenuated bacteria have a protective effect against subsequent infection. Abundant proof of the efficacy of active immunization is furnished by Pasteur's inoculations in chicken cholera, anthrax, and hydrophobia, Jennerian vaccination, and antityphoid inoculation. The data on protective inoculations against pyogenic infections are very meager, but the results that have been obtained in therapeutic inoculations against the gonococcus, streptococcus, staphylococcus, pneumococcus, etc., especially in chronic, subacute, and mildly acute localized infections, seems to show that injections of killed organisms hasten recovery and protect against relapse.

Webb[8] has observed a protection against influenza in cases inoculated with the killed organisms. Five patients inoculated against influenza with their own organisms, and eight inoculated against influenza with stock

vaccines, all giving histories of repeated former attacks, escaped an epidemic of influenza. Preventive inoculations were not given in 32 cases, the patients denying that they had ever had influenza, and 15 succumbed to the epidemic.

During the past two and three-fourth years—June 15, 1909, to March 1, 1912—I have administered autogenous vaccines in 122 cases of pulmonary tuberculosis. All these cases were under observation for two months or longer. Patients not under observation at least two months are not included in this report. It has been observed that during the past two and one-half years hemorrhages have been less frequent than in previous years. The class of patients, diet, exercise, sleeping conditions, etc., have been practically the same; the only new factor introduced into the treatment was the administration of autogenous vaccines. This led me to an investigation of the relationship between hemorrhage and the administration of autogenous vaccines for the secondary infection.

In 100 cases vaccines were made from organisms isolated from the sputum. In 22 cases vaccines were made from organisms isolated from the bloodstream. The whole group of 122 cases is compared with the group not receiving vaccines, and the cases receiving vaccines made from organisms isolated from the sputum and blood are considered separately.

The results are tabulated as follows:

TABLE 1.—HEMORRHAGES IN PATIENTS NOT RECEIVING VACCINES

	Number of Cases	Hemorrhages	Per Cent. Hemorrhages
Incipient	28	1	3.57
Advanced	117	11	9.4
Far advanced	13	2	15.39
Total	158	14	8.86

TABLE 2.—HEMORRHAGES IN PATIENTS RECEIVING VACCINES MADE FROM ORGANISMS ISOLATED FROM SPUTUM OR BLOOD

	Number of Cases	Hemorrhages	Per Cent. Hemorrhages
Incipient	7	..	0.0
Advanced	103	2	1.9
Far advanced	12	2	16.66
Total	122	4	3.28

TABLE 3.—HEMORRHAGES IN PATIENTS RECEIVING VACCINES MADE FROM ORGANISMS ISOLATED FROM THE SPUTUM

	Number of Cases	Hemorrhages	Per Cent. Hemorrhages
Incipient	4	..	..
Advanced	87	..	..
Far advanced	9	2	22
Total	100	2	2

TABLE 4.—HEMORRHAGES IN PATIENTS RECEIVING VACCINES MADE FROM ORGANISMS ISOLATED FROM THE BLOOD

	Number of Cases	Hemorrhages	Per Cent. Hemorrhages
Incipient	3	..	..
Advanced	16	2	12.5
Far advanced	3	..	..
Total	22	2	9

TABLE 5.—RESULTS IN CASES SHOWING DISTINCT HEMORRHAGIC HISTORY; PATIENTS NOT RECEIVING VACCINES

Number Showing Hemorrhagic History	Hemorrhages While in Institution (Three to Five Months)	Per Cent. Hemorrhages
22	4	18.1

TABLE 6.—RESULTS IN CASES SHOWING DISTINCT HEMORRHAGIC HISTORY; PATIENTS RECEIVING VACCINES

Number Showing Hemorrhagic History	Number Having Hemorrhages in Institution After Vaccine Was Begun (Three to Five Months)	Per Cent. Hemorrhages
29	1	3.4

From these tables it is seen that the percentage of hemorrhage in cases receiving vaccines is less than one-third of that in cases not receiving vaccines. It is also seen that the percentage of hemorrhage in cases treated with vaccines made from organisms isolated from the sputum is very much lower than it is in cases with vaccines made from organisms isolated from the blood. The results shown in cases showing hemorrhagic tendencies are also very suggestive of the protective effect of the vaccines. Taking the advanced cases only for comparison, for it is in this group that we would naturally look for the best results, the statistics are very striking.

ADVANCED CASES ONLY

Number Receiving Vaccine	Hemorrhages	Per. Cent.
87	..	..
Number Not Receiving Vaccine	**Hemorrhages**	**Per Cent.**
117	11	9.4

While it is not admissible to draw definite conclusions from a study of 280 cases, the results are indicative, and, I believe, will justify the administration of autogenous vaccines in a large number of cases as a protective measure in the same way that typhoid inoculations are used in the prevention of typhoid fever.

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ADVANCED TUBERCULOSIS CONFINED TO ONE LUNG; A COMPARATIVE ANALYSIS OF 150 CASES

By F. C. Smith, M.D.
Fort Stanton, N. M.

The present study comprises 1705 moderately advanced and far-advanced cases, so classified on admission to the Marine-Hospital Sanatorium, and particularly 150 of those in which no sign of disease was detected in one lung, either at the first examination or at the second, two months later.

In 95 of these the right lung was involved, in 55 the left. It is possible that the opposite apex had been previously involved, the left seven times and the right eleven, as slight variations from normal, but no signs of active disease were detected in these instances.

TABULATION OF CASES OF ADVANCED DISEASE CONFINED TO ONE LUNG ON ADMISSION

U. S. Marine-Hospital Sanatorium

Moderately Advanced

	Apparently Cured	Arrested	Improved	Unimproved	Dead
Whole number, 693	111	119	302	66	95
Confined to one lung, 87	26	22	21	13	5*
Right lung involved, 59 .	18	19	12	7	3
Left lung involved, 28...	8	3	9	6	2

Far-Advanced

	Apparently Cured	Arrested	Improved	Unimproved	Dead
Whole number, 1012 ...	26	125	234	115	512
Confined to one lung, 63	5	20	12	7	19*
Right lung involved, 36.	3	12	7	5	9
Left lung involved, 27 ..	2	8	5	2	10

* Two of the 24 cases were not autopsied.

Advanced one-sided disease is thus seen to be nearly twice as frequent on the right side as on the left, which supports in a measure the idea that the right side is most frequently attacked. The comparatively small number of cases, however, would indicate that disease past incipiency is not long confined to one lung.

While under treatment the sound left lung became involved 22 times out of 95, and the sound right lung 15 times out of 55, the disease showing very little difference in its relative tendency to extend from one lung to the other. This fresh involvement of the sound lung was evanescent, subacute, and never serious in 19, and was not detected before autopsy in 5, while in 12 instances an acute involvement of the sound lung was serious enough to have caused death soon, although 3 of these patients died of hemorrhage. Of the 12 last mentioned, 7 were right-sided cases which extended to the left lung, and 5 were cases of left-sided disease extending to the right. Only one normal lung was found in the 22 autopsies in this series, *i. e.*, the right lung in the patient dying from ruptured aortic aneurysm.

When the better lung became involved, the apex was the part usually first affected, but the antero-external portion of the base of the left upper lobe was attacked twice and the antero-external border of the left lower lobe once, the latter being found only at autopsy, a very small patch of subpleural infiltration.

Comparing the results in advanced one-sided cases with advanced disease in both lungs, the one-sided cases show, as might be expected, a much higher percentage of recoveries. Thus, while the one-sided cases furnish only 8.8 per cent. of the whole number, they show 22.6 per cent. of the apparent cures, 17 per cent. of the arrests, and only 4 per cent. of the deaths.

There were 24 deaths in this series: 1 caused by ruptured aortic aneurysm, 1 by tabes dorsalis and tuberculosis of the kidneys, 1 by pneumothorax, 1 by tuberculosis of the larynx, 1 by empyema, 1 by nephritic coma, 1 by hemorrhage from the bowel, 7 by hemorrhage from the lung, 2 by acute invasion of the better lung following hemorrhage, 4 by acute invasion of the better lung without known cause, and the remaining 4 by sepsis, invasion of the better lung, and advanced terminal changes. An unusually large number of deaths in this series was due to accident or complication peculiar to tuberculosis. I believe that advanced cases with disease confined to one lung enjoy a greater degree of chronicity than the usual type of advanced case, and that chronicity affords greater opportunity for accident or complication. This has been previously investigated with regard to death

from hemorrhage at the Fort Stanton Sanatorium.* It should be noted that we have had 71 deaths from hemorrhage out of a total of 658 fatalities at this station, a mortality of 10.8 per cent. from hemoptysis. In this series, however, of 24 deaths 7, or over 29 per cent., were due to hemorrhage from the lungs.

Comparing the results of treatment of the cases of right-sided involvement with those of left-sided, there is no great difference. Reduced to percentages and tabulated it is seen that the cases of right lung involvement show slightly better results.

COMPARISON OF RESULTS OF TREATMENT; RIGHT-SIDED AND LEFT-SIDED INVOLVEMENT

	Moderately advanced		*Far-advanced*	
	Right Lung Involved	Left Lung Involved	Right Lung Involved	Left Lung Involved
Apparently cured	31 per cent.	28.5 per cent.	8 per cent.	7 per cent.
Arrested	32 per cent.	11 per cent.	33 per cent.	30 per cent.
Improved	20 per cent.	32 per cent.	20 per cent.	19 per cent.
Unimproved and dead	17 per cent.	28.5 per cent.	39 per cent.	44 per cent.

Symptoms.—Dyspnea and pulse-rate were compared in this series, with the following results: Seventeen per cent. of cases with right lung involvement suffered considerable dyspnea, 12 per cent. of cases with left lung involvement were so affected. Sixty-one per cent. of right lung involvement had an average pulse-rate above 84, 69 per cent. of left lung involvement showed pulse-rate above this number. There would seem to be no great difference in the amount of respiratory or circulatory embarrassment caused by involvement of either lung.

As a matter of casual interest I investigated all the phenomenal recoveries from very far-advanced disease at the Fort Stanton Sanatorium. By this is meant those cases where patients with complete involvement of at least one lung and extensive excavation have sufficiently recovered to work and otherwise lead an active life for several years. The average stay of these individuals at the Sanatorium was a little over three years, all being employed as attendants at different times. There have been 19 such

* "Pulmonary Hemorrhage in the Tuberculous at High Altitude," Public Health Reports, vol. xxv, No. 4, October 17, 1910.

phenomenal cases, 11 being instances where the right lung was the one chiefly involved, and 8 where the left was more affected.

SUMMARY

1. Advanced pulmonary tuberculosis is not often (8.8 per cent. in this series) confined to one lung.

2. In advanced disease confined to one lung the right is affected most frequently.

3. Extension of disease from either lung to the opposite seems about equally frequent, and serious in about the same proportion.

4. The sound lung when freshly involved seemed to show a fair degree of resistance. The apex was usually first affected.

5. The prognosis in advanced disease confined to one lung is more favorable than when both are actively affected.

6. Deaths from accident (hemorrhage) or complications were unusually frequent; unusual chronicity is suggested as a possible explanation.

7. Cases where the right lung only was involved showed slightly better results than where the left only was affected.

8. Dyspnea and rapid pulse were experienced in about the same degree, dyspnea being slightly more noticeable in the cases of right-lung involvement and tachycardia in left-sided disease.

9. Of 19 recoveries from very far-advanced disease with restoration to working capacity, 11 were cases of right-lung involvement and 8 of left.

A FURTHER STUDY OF THE PROGNOSTIC VALUE OF ARNETH'S LEUKOCYTIC BLOOD-PICTURE IN PULMONARY TUBERCULOSIS, BASED UPON 729 COUNTS IN 475 PATIENTS

By Paul H. Ringer, M.D.
Asheville, N. C.

Three years ago, in a paper by Dr. C. L. Minor and myself,* there were reported the results of the first 100 Arneth counts done by us, together with deductions as to their probable prognostic value in cases of pulmonary tuberculosis. At this time, and in this meeting, it is unnecessary to go into the theory of the causation of this blood-picture and its variations. Suffice it to say that the blood-picture consists in a differential count of the polymorphonuclear neutrophiles with respect to the number of their nuclei. Five classes are recognized according to the number of nuclei in this variety of leukocyte. Arneth claims that in cases with low resisting power there is a preponderance of cells with one or two nuclei, while in cases with good resisting power the percentage of leukocytes with three, four, and five nuclei is increased. Thus in bad cases he obtains what he terms a shifting of the blood-picture to the left—"Verschiebung nach links." This blood-picture has been studied and Arneth's conclusions substantiated by many workers, including Arloing and Genty, Bushnell and Treuholtz, Edson, Klebs, Webb, and Williams. The work of Dr. Minor and myself agreed in the main with the results obtained by those mentioned above. We elected to divide our cases according to the clinical symptoms, rather than according to the amount of lung involvement, and grouped them into four classes:

1. Good.
2. Medium.
3. Bad.
4. Very bad.

*"Arneth's Method of Blood-counting: Its Prognostic Value in Pulmonary Tuberculosis," Am. Jour. Med. Sci., May, 1911.

Upon going over our counts and making a graphic representation of the results, we found that the one and two nuclei cells were greatest in the classes named "bad" and "very bad," and decreased in the classes named "good" and "medium," while the opposite was true of the cells with three, four, and five nuclei. In a small number of cases—not over four or five—we found together with a good clinical symptom-complex a very bad blood-picture, and we noted that shortly thereafter the patient took a turn for the worse.

Neither in the counts forming the basis for the paper above referred to nor in the counts following it, have the polymorphonuclear leukocytes been divided into subclasses (as Arneth was wont to do) based upon the shape of the nuclei—whether indented, S-shaped, crescentic, etc. This has been deemed unimportant. The same arbitrary rules for counting that were advocated in the article written three years back have been strictly adhered to. These are:

1. Nuclei connected by an isthmus counted as one nucleus. (By "isthmus" is meant a strand of nuclear matter one-third or more of the thickness of the nucleus.)
2. Nuclei connected by a thread counted as two nuclei.
3. Nuclei clearly superimposed counted as two nuclei.
4. Nuclei tangent to one another counted as two nuclei.

Thus, uniformity of counts done by the same worker was assured.

So much for a very brief review of the former results published by Dr. Minor and myself. Since that time the use of Arneth counts has been continued, and the writer wishes in this article to set forth conclusions arrived at from a total of 729 counts done on 475 patients. In addition to the counts done on tuberculous or supposedly tuberculous patients, the blood of 20 apparently normal individuals has been counted, in order to arrive at a "normal" blood-picture.

The average of these 20 counts gives as normal blood-picture the following:

	I	II	III	IV	V	Index
Per cent.	4	20.5	58.5	15	2	53.75

This average is slightly better than that obtained by Arneth from the average of fifteen supposedly normal individuals. His "normal" blood-picture reads as follows:

	I	II	III	IV	V	Index
Per cent.	5	35	41	17	2	60.5

The "index," so called, is one arbitrarily adopted by Bushnell, and is obtained by adding together the percentages of classes I and II, and half that of class III, thus showing what percentage of the cells is to the left in the blood-picture. This index has the advantage of showing at a glance whether the blood-picture is good or bad; but it has the disadvantage that it tends to relegate into the background the relative proportions of the various classes, and especially that it recognizes no difference between classes I and II, a difference that is not without importance.

As a result of over 700 counts, the conclusions drawn can be neither as unified nor as satisfactory as those derived three years ago from 100 counts; showing that greater familiarity with a method both enhances its value and indicates its limitations. The writer does not wish to be thought to mean that the Arneth blood-picture is to be considered as valueless, misleading, or false. Far from it. The blood-picture is of a certain value; it should not be abandoned, and it will in certain apparently favorable cases correctly presage an unfortunate outcome, or vice versa. The writer, however, must confess that he cannot place as much weight upon its prognostic value as he did three years back.

First and foremost, it must be distinctly understood that the Arneth blood-picture can in no way be taken to indicate the amount of lung involvement or the stage of the disease. *It is simply and solely an index of the resisting power of the patient.* Patients with extensive local lesions, usually of the fibroid type, showing but little activity and having a good general state of nutrition, will give a relatively good blood-picture; while others with but very slight local lesions but poor nutritional conditions will give a bad picture. As an example of the first class may be cited the blood-picture of a man (J. B. McG.) with fibroid phthisis of fifteen years' duration, extensive pulmonary involvement, but good general condition:

	I	II	III	IV	V	Index
Per cent.	12	45	35	7	1	74·5

a relatively good blood-picture, especially when contrasted with that of the following patient (McD.), having but suspicious signs of a unilateral basal pleurisy, no cough, no bacilli in the very scanty sputum, but in very poor general condition. His blood-picture was as follows:

	I	II	III	IV	V	Index
Per cent.	12	42	42	4	0	75

decidedly bad for a patient with such slight evidences of disease.*

* Since this paper was written this patient reacted violently to 2 mgm. of old tuberculin.

Again, improvement in the blood-picture, or the reverse, indicates a corresponding change in the resisting powers of the patient, and that alone. To be sure, such changes are usually accompanied by betterment or further extension of physical signs, but there are always patients to be found whose general condition improves markedly while the physical signs remain stationary, just as there are others that begin to go down-hill without any detectable change taking place in the local pulmonary condition. It is in such cases that the blood-picture is of distinct value. The three following cases will illustrate this point:

1. In a patient running no fever (W. B.), and with slight unilateral apical catarrh, the following relatively bad picture was found:

	I	II	III	IV	V	Index
Per cent.	20	45	30	5	0	80

One month later the reading was:

	I	II	III	IV	V	Index
Per cent.	38.5	49.5	10.5	1.5	0	93.5

This was soon followed by an acute exacerbation of his disease which shortly ended fatally.

2. The patient (Col. B.), a man in excellent condition, showed but the faintest signs of pulmonary involvement—granular or rude breathing at the right apex anteriorly and posteriorly. His blood-picture on arrival was:

	I	II	III	IV	V	Index
Per cent.	3	29	55	12	1	59.5

Seven weeks later, 14 pounds having been gained, but the physical signs being identically the same, he showed:

	I	II	III	IV	V	Index
Per cent.	4	20	56	18	2	52

3. A man (Rev. M. L. B.), of slender build and excessively nervous temperament, pale, anemic, and generally run-down, showed at both apices definite breath changes but no adventitious sounds. His blood-picture on arrival was:

	I	II	III	IV	V	Index
Per cent.	36	48	16	0	0	92

This pointed to an unfavorable termination, despite the slight physical signs. Three months later, having gained much in weight and strength, his lungs showed in addition to the modified breath-sounds a few fine crackles

at one apex anteriorly and posteriorly. The blood-picture at this time, however, showed the following:

	I	II	III	IV	V	Index
Per cent.	24	42	27	7	0	79.5

a great improvement, substantiated by the man's general condition, despite the increase in physical findings.

These three cases serve to stress the point that by means of the Arneth blood-picture we obtain an index of the general resisting power of the patient, and of that alone.

In mentioning the index used in the blood-picture it was stated that it was apt to be misleading by taking the attention away from the percentage of cells in the various classes, and making no differentiation between classes I and II. The following case well illustrates this point: A patient (F. R. H.) with marked pulmonary and slight laryngeal involvement showed upon arrival the following bad blood-picture:

	I	II	III	IV	V	Index
Per cent.	31	46	20	1	2	87

Two and a half months later, having made great improvement, his picture was as follows:

	I	II	III	IV	V	Index
Per cent.	15	53	27	5	0	81.5

No very striking difference is seen upon looking at the indices, but it must be noted that the cells in class I are reduced by over 50 per cent., and the cells in class IV increased 500 per cent., this being significant despite the loss of cells in class V. In the writer's opinion a bad blood-picture with the percentage in class I in excess of that in class II is far worse than one in which the members of class II are in the majority.

So far attention has been called to counts tending to prove the value of the blood-picture in estimating the resisting power of the patient, and consequently in shaping our prognosis. In all fairness the other side of the question must not be taken up, and cases cited in which the blood-picture has been misleading.

It is an undeniable fact that in a small number of cases the blood-picture has been at absolute variance with the clinical picture, and the subsequent course of the case has in no way accounted or atoned for the anomalous blood-findings. It has been quite impossible to estimate exactly the percentage of cases in which this condition has been found, because of the impracticability of eliminating external (and also internal) agencies that could

not be foreseen and that had either a salutary or else a deleterious effect upon the patient. In the writer's opinion about 5 per cent. of the cases show a blood-picture totally at variance with the clinical picture, and not borne out by subsequent events. This occurs chiefly in cases with good general symptoms and satisfactory local signs.

A patient (R. S.) came to Asheville in March, 1909, with but slight physical signs and in excellent general condition. However, from the nature of the onset of the disease and from the quality of the signs, the trouble was suspected to be of an acute nature. Upon arrival the blood-picture was as follows:

	I	II	III	IV	V	Index
Per cent.	21	55.5	21	2.5	0	87

Two months later, the patient having markedly improved, the picture read:

	I	II	III	IV	V	Index
Per cent.	23	47.5	29	0.5	0	85

practically no change. Two months later the general and local condition having shown still further improvement, the picture remained unchanged, to wit:

	I	II	III	IV	V	Index
Per cent.	20	48	32	0	0	84

The patient has been heard from recently, and is now well and in the best possible condition.

Another patient (R. S. R.) came under observation with but very slight unilateral apical catarrh, no temperature; general condition excellent. The blood-picture was distinctly at variance with what would be expected. It read:

	I	II	III	IV	V	Index
Per cent.	19	52	23	6	0	82.5

The patient has improved and is in most satisfactory condition, but the last count done reads as follows:

	I	II	III	IV	V	Index
Per cent.	17	55	24	3	1	84

showing practically no change.

It would be wearisome to give more examples. The two cited amply illustrated the point.

Drs. Solis-Cohen and Strickler* have made a careful study of the Arneth blood-picture in cases of pulmonary tuberculosis. Their conclusions are here set forth.

*"The Leukocytic Picture in Pulmonary Tuberculosis," Amer. Jour. Med. Sci., November, 1911.

"While the average index showed little change, in most of our individual cases, the proportion of cells in the first two classes of Arneth seemed to be *increased* as the patient improved, and in a number of cases to be *decreased* [italics mine] as the patient grew worse. Of 27 improving patients whose blood was examined more than once, an increase in cells with one and two nuclei was observed in 22, and a decrease in 4. Among advancing cases there was an increase in 3, a decrease in 4, and no change in 2. Our figures are opposed to those of all other workers."

Such statements from such reliable authorities deserve serious consideration. It is quite impossible for the writer to explain the discrepancy. It would hardly be likely that the majority of Solis-Cohen and Strickler's cases were of the type exemplified by the last two examples cited. The only other way for accounting for the contradictory findings is the difference in the method of counting the nuclei, for in certainly 50 per cent. of the cells the nuclei are so placed or so connected that a doubt will arise as to which class the particular cell belongs. Were it possible for all workers in this field to agree upon a common set of rules for the estimation of the number of nuclei; and, furthermore, were it possible for different workers to count each other's smears, the real value of the method would be far better shown.

In a masterful paper on this subject which, unfortunately, came to the writer's notice but three days ago, Miller and Reed point out that the nuclei are greatly affected as to their number by the fact of either finger or slide being contaminated with dirt. This is a distinctly valuable point and also a prolific source of error. It is gratifying to note that such painstaking workers as those just cited believe that the Arneth blood-picture is of a very real value in prognosis.

In conclusion, the writer would state that in his opinion the Arneth blood-picture is of a certain definite importance in forming a prognosis in pulmonary tuberculosis. It is a corroboratory factor to the general clinical picture, and should never be given much weight in contradiction to the general symptom-complex presented by the patient. In a small number of cases it will presage an unfortunate outcome or else will cause us to pause before giving a bad prognosis. In a small number of cases it will remain opposed to all the general indications found in the patient. In the vast majority of cases it will faithfully represent the patient's resisting powers, but will not disclose any new features. The Arneth blood-picture is to be viewed with conservatism. Few that take it up and study it carefully will ever abandon it entirely, but he who places implicit confidence in its readings and bases his prognostic opinion chiefly thereon, will not infrequently be led into error.

THE POLYNUCLEAR NEUTROPHILE LEUKOCYTIC COUNT AS A GUIDE FOR THE ADMINISTRATION OF TUBERCULIN

By Wallace J. Durel, M.D.
New Orleans

Comparing the tabulated records of five thousand blood counts (leukocytic and differential) with the clinical records in fifty cases of tuberculosis, one is not only impressed with the fact that the polynuclear neutrophile leukocytes and the lymphocytes are susceptible to changes in numbers, but that the leukocytes are further subject to changes in their nuclear structures.

In looking over these blood records, the high percentage of polynuclear neutrophile leukocytes with one nucleus seems preponderant in those cases of tuberculosis advancing in the disease and showing a weakening in their cell resistance.

Further, we observe that injections of artificial tuberculin produce changes in the blood-picture of the polynuclear neutrophile leukocytes and lymphocytes varying according to the doses and the intervals of the injected tuberculin.

Further comparing the leukocytic pictures with the lymphocytic pictures, we observe that the latter are less susceptible to changes from the influence of artificial tuberculin "toxins" than the leukocytes.

The leukocytic changes observed have resulted, in the majority of instances, from a small increase in the quantity of tuberculin injected and without accompanying clinical manifestations; while the lymphocytic blood-pictures changed only after marked clinical disturbances and larger doses of tuberculin.

The leukocytic picture not only showed changes during the administration of tuberculin, but also changes from the effects of exercise, diet, rest, etc. This, in some instances, was brought about voluntarily by having the patients commit indiscretions in exercise, etc., for the sake of comparison.

As the patients fail in their resistance and show symptoms for the worse,

the blood counts show that the polynuclear neutrophile leukocytes remain higher in their percentage of cells with one nucleus. This high percentage does not fall as frequently and for so long a time as in the improving cases, where the percentage of one-nucleus cells drops 20 to 60 per cent., to rise again only at longer intervals when indiscretions in exercise, diet, or tuberculin are committed.

All cases under observation upon the final overcoming of their disease have shown a low percentage of leukocytes with one nucleus, and a corresponding increase of leukocytes with two, three, four, or five nuclei. These cases also have all shown (though observed at sea level and not at high altitude) that the lymphocytes increase 20 to 40 per cent. as the disease is conquered, remaining so as long as no retrogressive symptoms manifest themselves. This I have observed in many cases where the disease was arrested, the patients remaining well for years, and still showing the high lymphocytic count.

Another observation made here points out the fact that when resistance failed, the polynuclear neutrophile leukocytic blood-picture showed an increase in the leukocytes with one nucleus long before the lymphocytic picture changed, the latter changing only after marked clinical manifestations had developed.

This would show that the polynuclear leukocytes are more delicate and sensitive to the effects of tuberculin toxic products than the lymphocytes.

From the above we might conclude that the polynuclear neutrophile leukocytes are the chief resisting cells of the body, being the first to show their activity in resisting the effects of infectious toxins, and that the lymphocytes act as a reserve force, but nevertheless essential in accomplishing a victory for the leukocytic battle.

Upon studying the polynuclear neutrophile leukocytic blood-pictures in the above-named records, the first thing that strikes us is the difference in the percentage of polynuclear neutrophile leukocytes with three, four, and five nuclei, compared with the blood-picture as given by Arneth. Here I will venture to say that the polynuclear blood-picture, as described by Arneth, is perhaps not a clear and definite index of the percentage of polynuclears of the blood.

Of the five thousand or more blood-pictures that I have made during the past four years I was never able to get the same percentage of cells with one, two, three, four, and five nuclei (in the healthy or sick) as Arneth describes in his blood-pictures.

The higher percentage of leukocytes with three, four, and five nuclei

described by Arneth is, to my point of view, due to an imperfect staining of the nucleus and cell. I have used the stain as suggested by Arneth, and found a greater percentage of nuclei than when I used Wright's blood stain. At first, upon using Wright's blood stain, I found a higher apparent percentage of leukocytes with three, four, and five nuclei than later, when by modifying the technic of staining (that is, using Wright's stain for two to three minutes, and then dropping the water and washing immediately) I obtained smears with clearly defined nucleated cells, and with separate nuclei, but a percentage of polynuclear cells with three, four, and five nuclei much less than by the method of staining as suggested by Arneth.

This difference in the apparent number of nuclei does not discredit the fact that the polynuclear neutrophile leukocytes in tuberculosis are affected and influenced by the action of toxic tuberculin products. This we can see by looking over the blood-pictures and comparing these with the patient's daily clinical record.

You will observe in the following examples that reactions from tuberculin always occurred when the blood-picture was discarded, yet being higher in percentage of leukocytes with one nucleus. Note also the picture shifting to the left whenever there were changes from a tuberculin reaction, and again returning to its former percentage when tuberculin was discontinued or diminished in dosage.

EXAMPLE I

Pulmonary Tuberculosis, Third Stage. Temperature receding to normal after a few weeks' rest. Tuberculin B.E. administered according to the polynuclear neutrophile leukocytic blood-picture for months without any reactions occurring; then discarding the blood-picture and administering the tuberculin by the clinical method, we observe the following:

	1	2	3	4	5	Temperature		Dose of T.B.E.
April 18	80%	18%	2%	...	...	98.6	98.6	15–20 A.
" 20	92%	8%	...	...	...	98.6	98.6	None.
" 24	96%	4%	...	...	...	98.6	98.6	None.
" 26	98%	2%	...	...	...	98.6	98.6	3–20 A.
" 27	Reaction with pains, headache, etc.					101	101.6	None.
" 28	88%	12%	...	...	...	98.6	98.6	3–20 A.

No reaction following.

Note.—Solution "A" equals 0.005 mg. T.B.E. to 1 c.c.

EXAMPLE II

Pulmonary Tuberculosis, First Stage. Tuberculin B.E. administered according to the polynuclear neutrophile leukocytic picture for months without any reaction; then discarding the picture, we have the following:

		1	2	3	4	5	Temperature		Dose of T.B.E.
June	8	73%	26%	1%	...	...	98.6	98.6	4–20 A.
"	12	93%	7%	...	...	...	98.6	98.6	2–20 A.
"	13	Reaction with headache, pains, etc.					103		
"	19	88%	12%	...	...	...	98.6	98.6	2–20 A.
"	27	55%	42%	3%	...	...	98.6	98.6	...

No reaction following.

EXAMPLE III

Pulmonary Tuberculosis, First Stage. Tuberculin given by polynuclear neutrophile leukocytic picture for months without reaction; then by the clinical method with the following:

		1	2	3	4	5	Temperature		Dose of T.B.E.
June	6	65%	29%	6%	...	...	98.6	98.6	10–20 B.
"	8	74%	26%	...	...	...	98.6	98.6	12–20 B.
"	10	75%	25%	...	...	...	98.6	97.6	15–20 B.
"	13	73%	25%	2%	...	...	98.6	98.6	2–20 A.
"	15	92%	8%	...	...	...	98.6	98.6	5–20 A.
"	16	Reaction with headache, nausea, pains					100		
"	17	91%	9%	...	...	...	98.6	98.6	...
"	20	93%	7%	...	...	...	98.6	98.6	...
"	25	72%	24%	4%	...	...	98.6	98.6	5–20 A.

No reaction following.

EXAMPLE IV

Pulmonary Tuberculosis, Third Stage. Tuberculin B.E. given by the polynuclear neutrophile leukocytic picture, regardless of the fact of the daily rise in temperature, 99.4° to 100.2-5°. No reaction observed for months. When picture was discarded, we observed the following:

		1	2	3	4	5	Temperature		Dose of T.B.E.
October	4	84%	14%	2%	...	...	98.6	99	7–20 H.
"	6	86%	14%	...	...	...	98.6	99.2	9–20 H.
"	9	82%	18%	...	...	...	98.6	99	12–20 H.
"	11	92%	8%	...	...	...	98.6	99	...
"	13	88%	12%	...	...	...	98.6	99	10–20 H.
"	15	92%	8%	...	...	...	98.6	99	6–20 H.
"	18	92%	8%	...	...	...	98.6	99	8–20 H.
"	19	Reaction with pains, headache, etc.					102		
"	23	92%	8%	...	...	...	98.6	99	...
"	25	84%	16%	...	...	...	98.6	98.8	4–20 H.

No reaction following.

Note.—2–20 H. equals 0.0000000005 mg. T.B.E. to 1 c.c.

EXAMPLE V

Pulmonary Tuberculosis, Third Stage (Advanced). Temperature normal and tuberculin treatment begun; patient being under hygienic dietetic treatment and open-air treatment for three months. Polynuclear neutro-

phile leukocytic picture varying from 86 to 90 per cent. of No. 1. For months after starting tuberculin no reactions occurred until the blood-picture was discarded with the following:

		1	2	3	4	5	Temperature		Dose of T.B.E.
March	6	86%	4%	...	...	...	98.6	98.6	4–20 G.
"	9	91%	9%	...	...	...	98.6	98.6	6–20 G.
"	11	92%	8%	...	...	...	98.6	98.6	6–20 G.
"	12	Reaction with nausea, headache, etc.					103		
"	14	85%	15%	...	...	...	98.6	99.	1–20 G.
"	16	96%	4%	...	...	...	98.6	99.	5–20 H.
"	19	88%	12%	...	...	...	98.6	98.4	2–20 G.
"	20	Reaction, headache, pains, etc.				...	101		
"	22	94%	6%	...	...	...	98.6	98.6	...
"	27	87%	13%	...	...	...	98.6	98.6	3–20 G.

No reaction following.

Note.—Solution "G" equals 0.000000005 mg. T.B.E. to 1 c.c.

A fact to be noticed in this case is that when tuberculin in minute doses was given with a high percentage of one-nucleus cells, though virulent reactions did not appear, the patient showed a daily increase in temperature (99.5°) with symptoms of recrudescence. In such cases it is wise to use tuberculin only when the blood count drops 10 per cent., that is, below 88.

EXAMPLE VI

Pulmonary Tuberculosis, Third Stage (Advanced Diabetic). Tuberculin started one week after admittance to sanatorium, when temperature after rest dropped from 100° and 103° to 101°.

This case was given tuberculin regardless of the daily rise in temperature to 101°, and the dosage of tuberculin was given according to the polynuclear neutrophile leukocytic picture, with the result that no reactions followed until the picture was discarded after the patient's temperature (a few months after) had receded to normal.

		1	2	3	4	5	Temperature		Dose of T.B.E.
August	6	94%	6%	...	...	...	98.6	103	...
"	9	93%	7%	...	...	...	98.6	100.4	...
"	13	94%	6%	...	...	...	98.6	100.4	2–20 H.
"	16	87%	11%	2%	...	...	98	101–99.8	3–20 H.
"	18	87%	13%	...	...	...	98.6	101	4–20 H.
"	20	87%	13%	...	...	...	99	101.4	4–20 H.
"	23	93%	7%	...	...	...	98.6	101.4	...
"	25	90%	10%	...	...	...	98.6	101	3–20 H.
"	27	89%	11%	...	...	...	98.6	101	3–20 H.
"	30	87%	13%	...	...	...	98.8	101.2	5–20 H.

For three months tuberculin was administered as above, by the polynuclear neutrophile leukocytic blood-picture, the temperature by that time

dropping to 97.8°, 99.2°. Upon discarding the blood-picture, we observe the following results:

		1	2	3	4	5	Temperature		Dose of T.B.E.
December	18	78%	20%	2%	...	...	97.8	99.2	16–20 H.
"	20	98%	2%	...	...	...	97.8	99	...
"	22	96%	2%	2%	...	...	97.6	99	15–20 H.
"	23	Reaction with headache, etc.				...	101		
"	28	96%	4%	...	...	...	98.6	99.2	...
January		86%	14%	...	...	...	98.6	...	...
"		84%	16%	...	...	...	98.6	...	...

N. B.—This shows a case hypersensitive to tuberculin.

EXAMPLE VII

Pulmonary Tuberculosis, Third Stage. Tuberculin B.E. administered according to the polynuclear neutrophile leukocytic blood-picture for months; then the picture discarded with the following:

		1	2	3	4	5	Temperature		Dose of T.B.E.
July	6	73%	27%	...	...	...	98.6	98.6	6–20 G.
"	10	83%	17%	...	...	...	98.6	98.6	8–20 G.
"	14	76%	24%	...	...	...	98.6	98.6	10–20 G.
"	17	82%	18%	...	...	...	98.6	98.6	10–20 G.
"	18	Reaction with headache, etc.				...	101		
"	20	92%	8%	...	...	...	99.4	99.4	...
August	19	85%	15%	...	...	...	98.6	98.6	5–20 G.
"	22	88%	12%	...	...	...	98.6	98.6	7–20 G.
"	26	75%	25%	...	...	...	98.6	98.6	10–20 G.

No reaction following.

EXAMPLE VIII

Pulmonary Tuberculosis, Second Stage. This case shows great hypersensitiveness to tuberculin, the least dose of tuberculin B.E. causing a reaction. By adhering closely to the polynuclear neutrophile leukocytic blood-picture, no reactions were observed in this case during the course of treatment.

		1	2	3	4	5	Temperature		Dose of T.B.E.
June	30	77%	23%	...	...	...	98.6	99.3	7–20 H.
July	1	96%	4%	...	...	...	98.6	99.2	...
"	5	84%	16%	...	...	...	98.6	99.4	4–20 H.
"	7	67%	27%	6%	...	...	98.6	100.4	4–20 H.
"	9	87%	13%	...	...	...	98.6	100.2	5–20 H.
July	12	84%	16%	...	...	...	98.6	100	7–20 H.
"	14	84%	16%	...	...	...	98	99	9–20 H.
"	16	78%	22%	...	...	...	98.6	98.6	12–20 H.
"	19	91%	9%	...	...	...	98.6	98.4	...
"	21	85%	15%	...	...	...	98.6	98.4	10–20 H.
"	23	82%	18%	...	...	...	98.6	98.6	12–20 H.

N. B.—This case, after a few months, reached the dose of 5–1000 mg. without appearance of reaction.

EXAMPLE IX

Pulmonary Tuberculosis, Third Stage (Hypersensitive to Tuberculin). Tuberculin B.E. given according to polynuclear neutrophile leukocytic picture for five months without reactions. When discarding the blood-picture, we observe the following:

	1	2	3	4	5	Temperature		Dose T.B.E.
March 25	80%	20%	...	...	...	98.6	99	12–20 G.
" 28	96%	4%	...	...	...	98.6	98.6	...
" 30	88%	12%	...	...	...	98.6	98.6	12–20 G.
April 1	90%	10%	...	...	...	98.6	98.6	12–20 G.
" 5	92%	8%	...	...	...	98.6	98.6	...
" 6	88%	12%	...	...	...	98.6	98.6	14–20 G.
" 7	Reaction with headache and pains, etc.					102		
" 15	98%	2%	...	...	...	98.6	98.6	...
" 18	88%	12%	...	...	...	98.6	98.6	3–20 G.
" 20	96%	4%	...	...	...	98.6	99	...
" 24	96%	4%	...	...	...	98.6	98.6	5–20 G.

N. B.—The polynuclear neutrophile leukocytic blood-picture showing a continuous percentage from 92 to 98 of No. 1; tuberculin was discontinued for a few days until the blood-picture dropped to 88 per cent. one, 12 per cent. two.

EXAMPLE X

Glandular Tuberculosis (cervical). Tuberculin B.E. kept up for seven months without any reaction. The tuberculin was given according to the polynuclear neutrophile leukocytic blood-picture, until patient was free from any noticeable enlarged glands, when the neutrophile picture was discarded, with the following:

(Previous to this, blood-picture ranged from 63 per cent. No. 1 to 80 per cent. No. 1.)

	1	2	3	4	5	Temperature		Dose T.B.E.
March 16	84%	16%	...	...	...	98.6	98.6	6–20 2
" 21	92%	8%	...	...	...	98.6	98.6	...
" 22	84%	14%	2%	...	...	98.6	98.6	7–20 2
" 25	88%	12%	...	...	...	98.6	98.6	7–20 2
" 27	Reaction, headache, nausea, etc.				...	100.3		
" 28	94%	6%	...	...	...	98.6	99	...
" 29	96%	4%	...	...	...	98.6	98.6	...
" 31	88%	12%	...	...	...	98.6	98.6	2–20 2
April 1	94%	6%	...	...	...	98.6	98.6	...
" 3	76%	24%	...	...	...	98.6	98.6	3–20 2

No reaction following.

N. B.—Solution 2 equals 2 mg. T.B.E. to 1 c.c.

EXAMPLE XI

Pulmonary Tuberculosis, Third Stage (Advanced). Polynuclear neutrophile leukocytic picture never below 90 per cent. No. 1 for six months.

Attempts made to give 4–20 solution "H" with blood-picture at 90 resulted in repeated reactions with 100.2° F. of temperature. This is one example of a class of tuberculosis patients where tuberculin cannot be given without danger of reactions.

As seen from the above examples, tuberculin influences the polynuclear neutrophile leukocytes by the latter showing changes in the nucleus. To make sure that this is no coincidence, I have repeatedly and with control shifted the blood-picture by increasing or decreasing the dose of tuberculin B.E.

A patient with tuberculosis will show changes in a polynuclear neutrophile leukocytic blood-picture during a course of tuberculin twenty-four hours before the least clinical symptom manifests itself. The shifting of the blood-picture to the left, that is, the increase of the one-nucleus cells at the expense of multiple-nucleated cells, shows that a sufficient dose of artificial tuberculin has been injected and that the bone-marrow cells have responded to this stimulation.

Therefore, whenever we see the blood-picture shifting to the left, regulate the dosage accordingly, as then a sufficient amount of tuberculin has been injected, calling for the necessary supply of new cells. If the dose of tuberculin is increased when the picture has shifted to the left, it will cause an overcrowding of cells around the tubercular focus to such an extent that these cells will cause a pneumonic exudate, as shown by large moist râles appearing where finer râles were previously heard.

No patient in my observations has ever shown the same percentage of polynuclear neutrophile leukocytes during the tuberculin treatment. All have shown changes in the blood-picture varying with the doses of tuberculin and with their powers of resistance.

I feel that in polynuclear neutrophile leukocytic blood-picture we have a guide for the administration of tuberculin, permitting us to administer tuberculin in hypersensitive cases without the danger of repeated reactions.

Before coming at the above conclusion, I waited three years so that I could collect sufficient data, and that my laboratory findings would be corroborated by my clinical findings. Today I have collected this data, and I feel justified in placing this method of administering tuberculin before the medical world.

In conclusion, I will state that for comparison I have taken scores of cases in my clinic at the New Orleans Polyclinic, and administered tuberculin regardless of the blood count (however taking the blood counts for the sake of comparison), and that in innumerable instances these cases reacted

continuously to tuberculin B.E., while the cases treated by the blood-picture method never reacted to tuberculin B.E.

I am glad to report my present views upon this important subject, and hope that others who will take up this special work will agree with me in their findings, so that we will have a method by which we can administer tuberculin without the danger of repeated reactions, so placing within our reach a therapeutic agent probably the most important in the accessory treatment of tuberculosis.

THE EFFECT OF GRADUATED WORK UPON THE LEUKOCYTES IN PULMONARY TUBERCULOSIS

By Myer Solis-Cohen, M.D., and Albert Strickler, M.D.
Philadelphia

It has been shown by Sir Almroth Wright that immunizing responses can be evoked in the organism by artificially induced and by spontaneous auto-inoculations, as well as by the inoculation of bacterial vaccines. Intoxication effects and immunizing responses, similar to those which follow upon the inoculation of bacterial vaccines, must inevitably supervene upon the passage of bacteria or bacterial products into the general lymph- and blood-stream in association with a bacterial invasion of the organism. By means of curves Wright was able to show graphically the effect on the opsonic index of the inoculation of vaccines. A worker in his laboratory—Freeman, who studied in a similar manner the effect of massage on gonococcal joints, demonstrated that auto-inoculations follow upon all active and passive movements which affect a focus of infection.

In tuberculosis the auto-inoculations that follow exercise have been studied by Inman through the changes that occur in the opsonic index. He studied the blood of patients treated by gradually increasing amounts of work and observed an increase in the opsonic index as the patients were carefully put upon increasing work, except in a few instances, when an excessive auto-inoculation occurred, in which he found the negative phase. Those latter patients exhibited the same symptoms that follow an excessive dose of bacterial vaccine. By a return of the opsonic index to the normal, although the patient was doing the hardest kind of work, Inman was able to confirm the clinical diagnosis of arrest of disease. It was hoped that by means of observations on the opsonic index it would be possible to regulate with scientific accuracy the amount of stimulus in the form of exercise needed to induce artificial auto-inoculation. The many difficulties and inaccuracies associated with opsonic work, however, have led to a general abandonment of this method of studying the immunizing power of the blood.

In a series of papers presented during the past two years we have shown

that the degree of a patient's resistance to the tuberculous infection can be seen in the leukocytic picture. As the patient gets well we have found an increase in the proportion of lymphocytes and in the proportion of polymorphonuclear neutrophiles containing one nucleus and two nuclei (the first two classes of Arneth). We also found that a number of therapeutic agents of benefit in tuberculosis, as a rule, caused a similar change. The administration of the proper dose of tuberculin to a suitable patient was usually followed by a rise in the lymphocytic curve and in the curve representing the first two classes of Arneth. The giving of too large a dose of tuberculin or the giving of tuberculin to an unsuitable patient usually produced a fall in both these curves.

The object of the present investigation is to see if a similar change in the leukocytic picture follows the graduated, artificially induced auto-inoculations produced by graduated work.

The patients examined were inmates of the Philadelphia Jewish Sanatorium for Consumptives at Eagleville, Pa., situated 600 feet above sea-level. The patients are graded as to the stage of the disease, according to the classification of the National Association for the Study and Prevention of Tuberculosis, and are further grouped according to Turban's classification. We divide cases in Stage III into those capable of working and those incapacitated, the latter being subdivided into the toxic and non-toxic. We also classify according to the results of treatment, following the nomenclature of the National Association.

The blood was stained with hematoxylon and eosin. The leukocytes are divided into polymorphonuclear neutrophiles, lymphocytes (mononuclear cells in which the nucleus is larger than the surrounding protoplasm), mononuclear cells (in which the nucleus is smaller than the surrounding protoplasm), transitional cells, and eosinophiles. We subdivide the polymorphonuclear neutrophiles according to the number of nuclei contained, regarding a thin filament as joining distinct nuclei and a wider band as being part of one nucleus.

With some of the patients graduated work was the only form of therapy employed. Others were treated in addition by means of tuberculin or drugs. In a number of cases the work was started at five minutes a day and increased at the rate of five minutes daily. One hour's work a day was the initial exercise in many instances, with an increase of an hour at an interval of one or more weeks.

Patients on Graduated Work Alone

Case I.—C. S., aged seventeen years, female, Stage I, Class I, improving. The patient was in bed November 19th to December 3d; and on the cure chair continuously during the day except for meals and two hours in bed after dinner from December 3d to 20th. On December 20th, in addition to the "cure," she was put on five minutes' work daily, increasing five minutes each day. On January 3d she was working one hour and five minutes, and on January 30th three hours and a half. The leukocytic counts on these two days were:

Date	Percentage of				
	Polynuclears (I II III IV V)	Lymphocytes	Mononuclears	Transitionals	Eosinophiles
January 3, 1912....	82 (5 36 54 0 0)	17	1	0	0
January 30, 1912...	65 (10 62 28 0 0)	35	0	0	0

This shows a marked increase in the proportion of lymphocytes, which was low, and in the first two classes of Arneth.

Case II.—C. S., aged thirty-four years, female, Stage III, Class III, capable, improving. The patient was reclining on the cure chair during the day, except at meal-time and while resting in bed one hour after dinner from January 29th until March 3d. On March 3d she began to work five minutes a day, with a five minutes' daily increase. On April 4th she was working two hours and three-quarters. Her blood-picture follows:

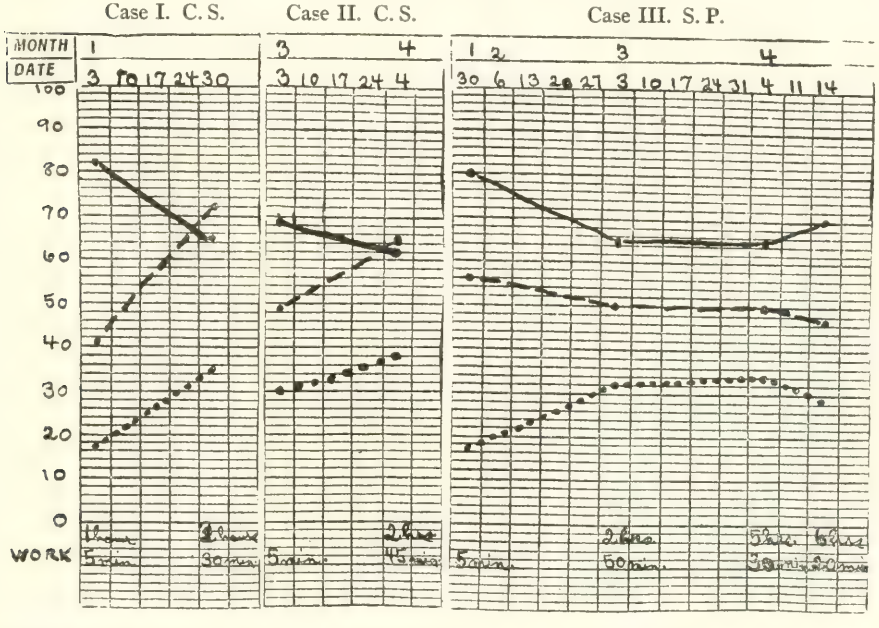
Date	Percentage of				
	Polynuclears (I II III IV V)	Lymphocytes	Mononuclears	Transitionals	Eosinophiles
March 3, 1912.....	69 (10 39 51 0 0)	30	0	0	1
April 4, 1912.....	62 (5 60 35 0 0)	38	0	8	0

This shows a moderate increase both in the proportion of lymphocytes, which was high, and in the first two classes of Arneth.

Case III.—S. P., aged twenty-two years, female, Stage I, Class I, stationary. The patient was on strict "cure," with one hour's rest in bed after dinner from December 3d to 20th. On December 20th she was given five minutes' work daily with a five minutes' daily increase. On January 3d

the patient was working an hour and a quarter a day and was kept on this amount until January 14th, when she was put on strict "cure," with two hours in bed after dinner. On January 30th five minutes' work was again given, increasing five minutes daily. On March 3d the patient was working two hours and fifty minutes, on April 4th five hours and a half, and on April

PATIENTS ON GRADUATED WORK ALONE



Polymorphonuclear cells = ——— Lymphocytes = ... Arneth I and II = — — —

14th, six hours and twenty minutes. The differential counts on those days follow:

Date	Percentage of				
	Polynuclears (I II III IV V)	Lymphocytes	Mononuclears	Transitionals	Eosinophiles
January 30, 1912	80 (16 40 44 0 0)	17	0	0	3
March 3, 1912	65 (4 46 50 0 0)	32	2	0	1
April 4, 1912	65 (4 46 50 0 0)	34	0	0	1
April 14, 1912	70 (7 40 53 0 0)	29	1	0	0

This shows a marked increase in the proportion of lymphocytes during the first month, a slight further increase during the next month, followed by a moderate decrease during the next ten days. The first two classes of Arneth exhibited a slight decrease the first month, remained stationary the next month, and during the next ten days showed a further slight decrease.

Case IV.—I. K., aged forty-eight years, male, Stage I, Class I, improving. The patient, who had been on strict cure since December 23d, was put on ten minutes' work January 3d, with a five minutes' daily increase. On March 3d he was working eight hours, having increased more than had been allowed. The blood showed:

Dates	Percentage of											
	Polynuclears	(I	II	III	IV	V)	Lymphocytes	Mononuclears	Transitionals	Eosinophiles
January 3, 1912....	60	(1	62	33	4	0)	40	0	0	0
March 3, 1912.....	59	(5	50	45	0	0)	32	8	0	1

During the two months the percentage of polymorphonuclear cells had not changed, but the percentage of lymphocytes, which was very high, was diminished at the expense of the mononuclear cells. There was a moderate decrease in the first two classes of Arneth.

Case V.—J. Q., aged thirty-eight years, male, Stage I, Class I, improving. The patient was doing the hardest kind of work for six hours a day on July 3d, which was increased to eight hours on July 3d, and to ten hours on July 10th. The blood-pictures follow:

Date	Percentage of											
	Polynuclears	(I	II	III	IV	V)	Lymphocytes	Mononuclears	Transitionals	Eosinophiles
July 3, 1910.....	53	(0	20	63	16	1)	45	0	0	2
July 25, 1910.....	56	(4	38	50	8	0)	40	3	0	1

A very marked increase occurred in the first two classes of Arneth, while a slight decrease in the proportion of lymphocytes, which was exceedingly high, occurred, largely to the advantage of the mononuclear cells.

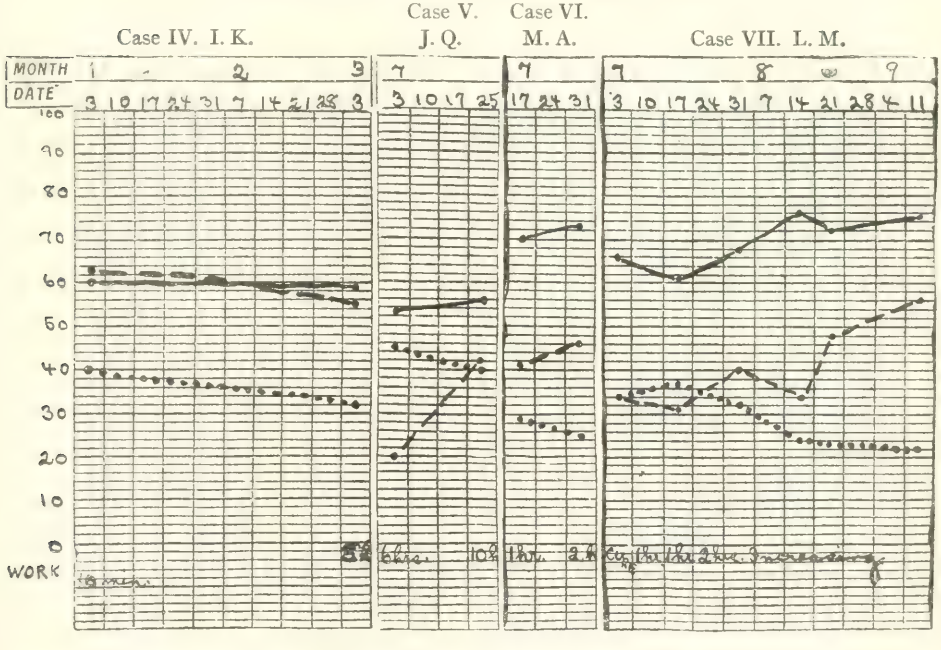
Case VI.—M. A., aged thirty-nine years, male, Stage II, Class 2, stationary. The patient was on strict cure from July 7th to 16th. On July 16th

he was put on one hour's work a day, gradually increased to two hours daily. The blood showed:

Date	Percentage of				
	Polynuclears (I II III IV V)	Lymphocytes	Mononuclears	Transitionals	Eosinophiles
July 17, 1910.....	70 (0 41 56 3 0)	29	0	0	1
July 31, 1910	73 (1 45 48 6 0)	25	0	0	2

There was a slight decrease in the proportion of lymphocytes, which was fairly high, but within normal limits, and a slight increase in the first two classes of Arneth.

PATIENTS ON GRADUATED WORK ALONE



Polymorphonuclear cells = ——— Lymphocytes = ... Arneth I and II = — — —

Case VII.—L. M., aged thirty-nine years, male, Stage III, Class 3, capable, improving. The patient was kept on strict "cure" from June 21st to

July 10th, when he was given one hour's work daily, which was increased to two hours on July 16th, and from that time gradually increased further. From July 16th to September 11th he was taking iodoform, and from August 28th to October 23d was treated by means of Bier's hyperemia. The differential counts were:

Date	Percentage of				
	Polynuclears (I II III IV V)	Lymphocytes	Mononuclears	Transitionals	Eosinophiles
July 3, 1911.....	66 (0 34 65 1 0)	34	0	0	0
July 17, 1911.....	61 (1 30 67 2 0)	37	0	0	2
July 31, 1911.....	68 (6 34 58 2 0)	32	0	0	0
August 14, 1911....	76 (1 33 63 3 0)	24	0	0	0
August 21, 1911....	71 (2 47 51 0 9)	23	2	4	0
September 11, 1911.	75 (3 53 43 1 0)	22	2	0	1

The percentage of lymphocytes, which already was very high, showed at first a slight increase, then a moderate decline, and then a marked diminution, followed by a very slight but gradual decrease. The first two classes of Arneth showed first a slight decrease, then a moderate increase, followed by a slight diminution, and that by a marked and then a moderate increase.

Case VIII.—A. K., aged twenty-eight, female, Stage III, Class 3, incapacitated, non-toxic, stationary. The patient was put on absolute rest April 1st. On April 9th she was put on "cure" and the next day was given one hour's work daily, increased on April 17th to one hour and a half, and on May 22d to two hours, increasing. On June 12th she was put to bed. On June 1st she was given iodoform by mouth in doses of $\frac{1}{8}$ grain, increased by $\frac{1}{8}$ grain every five days.

The blood examinations resulted as follows:

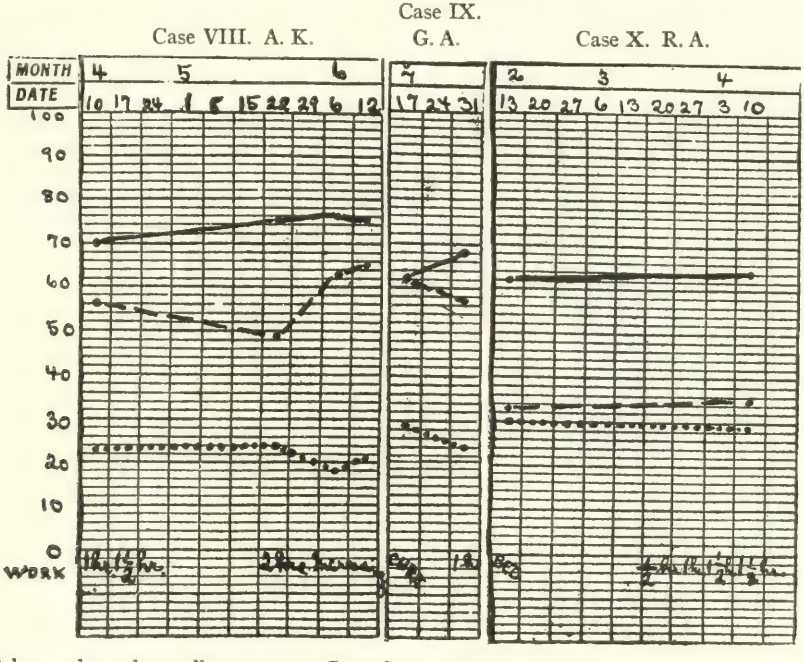
Date	Percentage of				
	Polynuclears (I II III IV V)	Lymphocytes	Mononuclears	Transitionals	Eosinophiles
April 10, 1910.....	70.5 (7 49 37 7 0)	23	3	1.5	2
May 22, 1910.....	75 (8 41 45 6 0)	24	0	0	1
June 6, 1910.....	76 (17 46 33 4 0)	18	4	0	2
June 12, 1910.....	75 (15 50 32 3 0)	21	4	0	0

The percentage of lymphocytes, which was normal, showed first a very slight increase, followed by a moderate decrease and then a slight increase.

The first two classes of Arneth showed first a moderate decrease, followed by a fairly marked increase, then a very slight increase, and then a slight decrease.

Case IX.—G. A., aged thirty-five years, male, Stage III, Class 2, incapacitated, non-toxic, improving. The patient was at absolute rest in bed until June 19th, when he was allowed to sit up half an hour, increased

PATIENTS ON GRADUATED WORK ALONE



Polymorphonuclear cells = ——— Lymphocytes = ... Arneth I and II = — — —

gradually to two hours. On July 10th he was put on "cure," and on July 16th he was given one hour of exercise daily, but on July 31st was put on strict "cure," with rest in bed after dinner.

The blood-pictures follow:

Date	Percentage of					
	Polynuclears (I II III IV V)	Lymphocytes	Mononuclears	Transitionals	Eosinophiles	Basophiles
July 17, 1910.....	62 (17 44 31 8 0)	29	3	4	2	0
July 31, 1910.....	68 (11 46 34 9 0)	24	3	1	2	2

There was a slight diminution in the lymphocytes and in the first two classes of Arneth.

Case X.—R. A., aged twenty-two years, female, Stage III, Class 3, incapacitated, non-toxic, stationary. The patient was in bed on February 13th. On March 19th she was put on half an hour's work, increased on March 26th to one hour, and on April 3d to one hour and a half, where it remained on April 10th.

The blood showed:

Date	Percentage of				
	Polynuclears (I II III IV V)	Lymphocytes	Mononuclears	Transitionals	Eosinophiles
February 13, 1910..	62 (5.5 28 44.5 17 5)	30	6	0	2
April 10, 1910	64.5 (8 27 42 22 1)	29	3	3	0.5

The blood-picture remained practically unchanged.

Patients on Both Tuberculin and Graduated Work

Case XI.—S. C., aged eighteen years, male, Stage I, Class 1, stationary. On December 3d the patient was put on a strict "cure," with rest in bed for two hours after dinner. On January 3d he was put on five minutes' work daily, with an increase of five minutes every three days, but eleven days later he was again put on strict "cure." On January 30th he was put on five minutes' work daily, increasing by five minutes every second day. Beginning January 3d the patient was given tuberculin (bacillus emulsion) by mouth, beginning with $\frac{1}{10000}$ milligram. On January 30th he had $\frac{3}{10000}$ milligram, and on April 4th $\frac{4}{10000}$. Tuberculin was stopped April 9th.

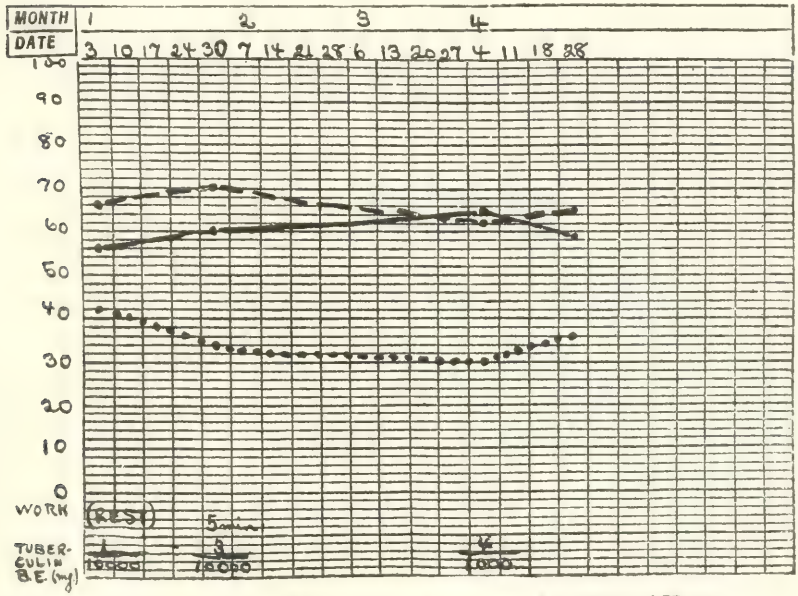
The blood counts are appended.

Date	Percentage of				
	Polynuclears (I II III IV V)	Lymphocytes	Mononuclears	Transitionals	Eosinophiles
January 3, 1912....	56 (10 56 32 2 0)	42	2	0	0
January 30, 1912...	60 (10 60 30 0 0)	34	6	0	0
April 4, 1912	65 (12 50 38 0 0)	30	3	1	1
April 28, 1912	59 (15 50 35 0 0)	36	3	2	0

There was a moderate decrease in the proportion of lymphocytes during the first two months, followed by a moderate increase. There was first a very moderate decrease in the first two classes of Arneth, followed by a very slight increase.

PATIENT ON BOTH GRADUATED WORK AND TUBERCULIN

Case XI. S. C.



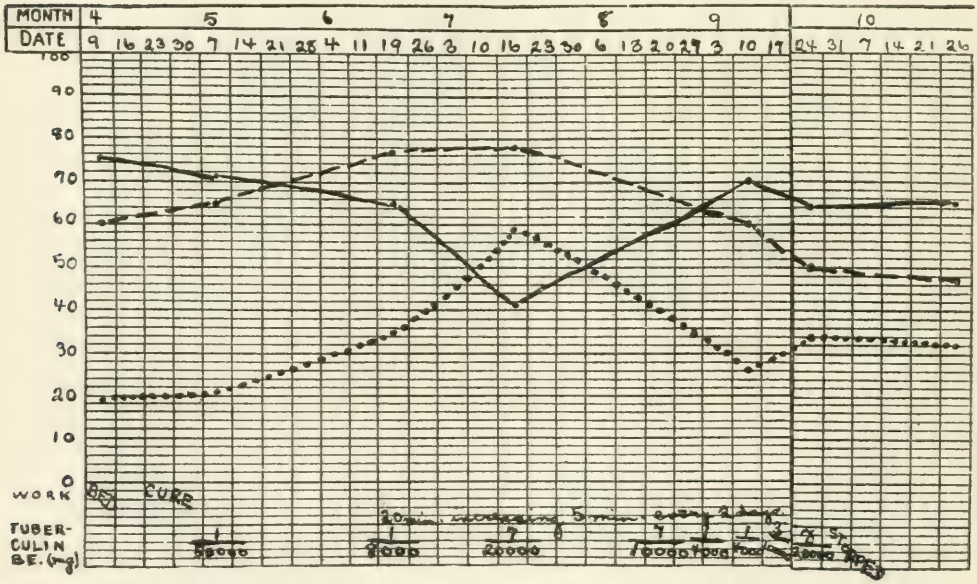
Polymorphonuclears = ——— Lymphocytes = ... Arneth I and II = — — —

Case XII.—T. M., aged five years, female, Stage II, Class 1, stationary. The child was put to bed on February 26th and put on strict cure March 26th. On June 18th she was given ten minutes' work twice daily, increasing by five minutes every second day. She was given tuberculin (bacillary emulsion) by mouth, beginning with $\frac{1}{50000}$ milligram on May 8th. On June 19th she received $\frac{1}{80000}$ milligram, and on July 16th, $\frac{7}{200000}$. On August 20th the dose had reached $\frac{7}{100000}$ milligram, but on August 25th was reduced to $\frac{1}{40000}$, at which it remained until September 13th, being given but once a week. On September 13th the dose was increased $\frac{1}{200000}$ at each weekly dose, on September 24th $\frac{3}{100000}$ being given. Tuberculin treatment was stopped September 27th, the patient leaving the sanatorium on Octo-

ber 2d. The child ran around after going home and took little rest during the day. Among the blood-pictures given is one taken three weeks after the child left the sanatorium.

Date	Percentage of				
	Polynuclears (I II III IV V)	Lymphocytes	Mononuclears	Transitionals	Eosinophiles
April 9, 1911.....	75 (5 55 40 5 0)	19	6	0	2
May 7, 1911.....	71 (9 56 35 0 0)	21	3	2	3
June 19, 1911.....	65 (7 70 23 0 0)	35	0	0	0
July 16, 1911.....	41 (6 72 22 0 9)	59	0	0	0
September 10, 1911.	70 (15 45 40 0 0)	26	4	0	0
September 24, 1911.	64 (8 42 50 0 0)	34	2	0	0
October 26, 1911...	65 (7 40 45 8 0)	32	3	1	0

PATIENT ON BOTH GRADUATED WORK AND TUBERCULIN
Case XII. T. M.



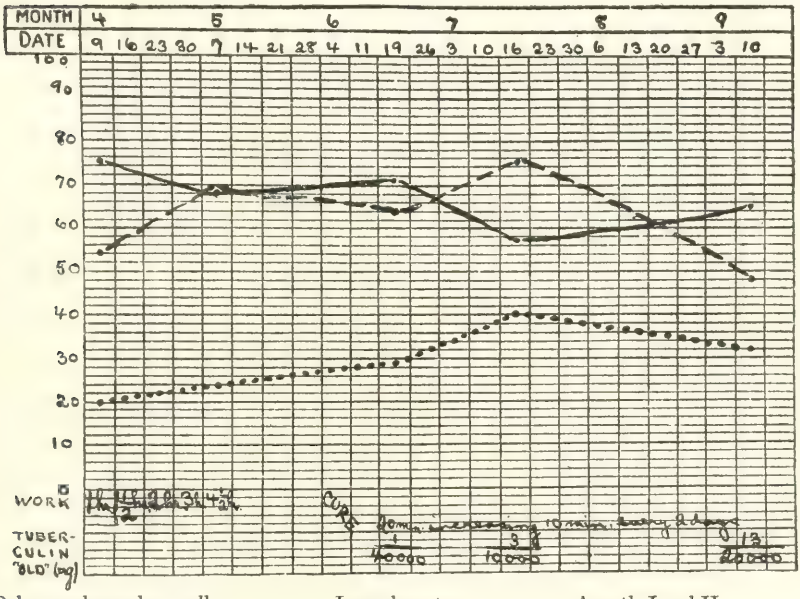
Polymorphonuclear cells = ——— Lymphocytes = ... Arneth I and II = — — —

The percentage of lymphocytes shows a marked increase following the institution of tuberculin treatment, and was nearly doubled after the addition of graduated work. After the reduction in the dose of tuberculin,

due to the belief that an excessive amount was being given, the percentage had dropped to less than half, but rose markedly after the dose of tuberculin was increased, and was not affected by the stopping of tuberculin treatment. The first two classes of Arneth were considerably increased after tuberculin was administered, but remained the same after the addition of graduated work. There was a marked drop after the dose was cut down, a further drop when it was again increased, and a slight additional drop after tuberculin treatment was stopped.

PATIENT ON BOTH GRADUATED WORK AND TUBERCULIN

Case XIII. L. S.



Polymorphonuclear cells = ——— Lymphocytes = ... Arneth I and II = — — —

Case XIII.—L. S., aged ten years, female, Stage II, Class 1, stationary. This patient was put on "cure" January 1, 1911, with two hours' rest in bed after dinner. On March 11th she was given half an hour's exercise daily, increased to one hour in a week, to an hour and a half on April 9th, and then increased half an hour every four days. On June 4th she was put on "cure." On June 18th she was given ten minutes' exercise twice daily, increased by five minutes every second day. The child was put on tuberculin treatment June 18th, being given $\frac{1}{40000}$ milligram of "old" tuberculin by mouth, the dose being repeated every four days with an

increase of $\frac{1}{40000}$ milligram. On July 16th the child was taking $\frac{3}{10000}$ milligram, with an increase every four days of $\frac{1}{20000}$. On September 6th she was given $\frac{13}{20000}$ milligram.

The blood counts follow:

Date	Percentage of				
	Polynuclears (I II III IV V)	Lymphocytes	Mononuclears	Transitionals	Eosinophiles
April 9, 1811	75 (4 50 43 4 0)	20	4	0	1
May 7, 1911	68 (8 61 31 0 0)	24	6	0	2
June 19, 1911	71 (2 62 36 0 0)	29	0	0	0
July 16, 1911	57 (11 64 25 0 0)	40	3	0	0
September 10, 1911	65 (10 38 52 0 0)	32	1	0	2

There was a moderate increase in the proportion of lymphocytes during the first course of graduated work, followed by another moderate increase after the child was put on cure. After the child was again put on graduated work and given tuberculin in addition there was a marked further rise in the proportion of lymphocytes, with a less marked fall two months later. There was also a moderate increase in the first two classes of Arneth during the first course of graduated work, with a slight decrease after the patient was put on "cure." There was a further moderate increase when the child was again put on graduated work, and at the same time given tuberculin, followed by a marked decrease after two months.

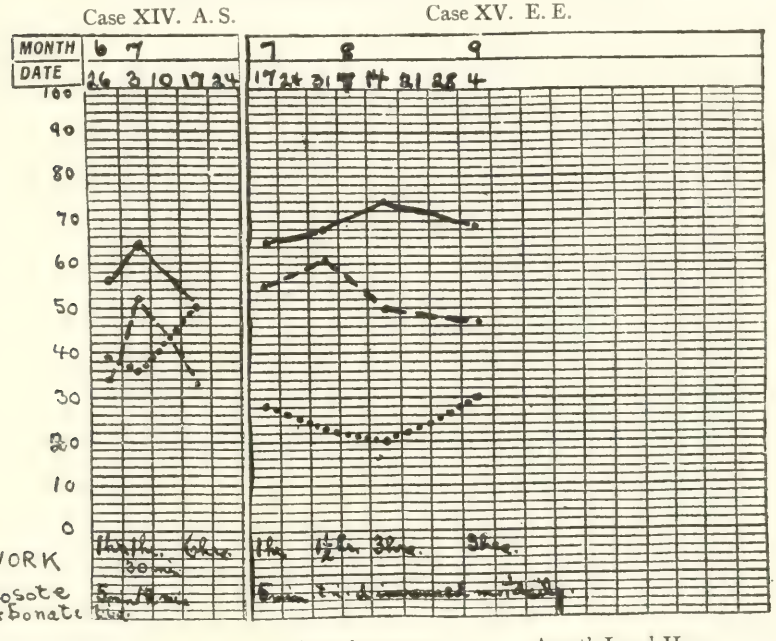
Patients on Both Graduated Work and Drugs

Case XIV.—A. S., aged eighteen years, male, Stage I, Class 1, improving. On June 26th the patient, who had been on a strict cure since June 15th, was put on one hour's work a day, with an increase of thirty minutes every fourth day. On July 16th he was working five hours. Creosote carbonate was administered June 26th in a dose of five minims three times daily, the dose being increased one minim a day. The blood-picture follows:

Date	Percentage of				
	Polynuclears (I II III IV V)	Lymphocytes	Mononuclears	Transitionals	Eosinophiles
June 26, 1910	56 (0 34 61 5 0)	39	2	0	3
July 3, 1910	64 (0 52 46 2 0)	36	0	0	0
July 17, 1910	50 (0 33 63 4 0)	50	0	0	0

During the first week there was a slight decrease in the proportion of lymphocytes, which was high, followed by a very marked increase during the next two weeks. There was first a marked increase and then just as marked a decrease in the first two classes of Arneth.

PATIENTS ON GRADUATED WORK AND DRUGS



Polymorphonuclear cells = ——— Lymphocytes = ... Arneth I and II = — — —

Case XV.—E. E., aged twenty-two years, female, Stage II, Class 1, improving. The patient was put on one hour's work July 13th, very gradually increased. On July 31st she was working an hour and a half, and on August 14th and September 4th, three hours. She was also given creosote carbonate on July 17th, in doses of five minims thrice daily, increased by one minim every day. It was stopped September 4th. The blood showed the following counts:

Date	Percentage of					
	Polynuclears (I II III IV V)	Lymphocytes	Mononuclears	Transitionals	Eosinophiles	Basophiles
July 17, 1910.....	65 (17 38 39 6 0)	28	3	3	1	0
July 31, 1910.....	68 (15 46 33 6 0)	23	3	1	3	2
August 14, 1910....	74 (5 45 37 12 1)	20	1	1	3	1
September 4, 1910 .	69 (3 44 48 5 0)	30	0	1	0	0

The proportion of lymphocytes showed a gradual moderate diminution during the first month, followed three weeks later by a marked increase. The first two classes of Arneth exhibited a slight increase after the first two weeks, followed by a moderate decrease, and later by a slight further diminution.

Discussion of the Cases

In studying the cases, a number of factors must be borne in mind: the percentage of the different cells before the patient was put on work—whether high or low or normal; the amount of work given at first, and the rapidity of the increase; whether the patient was benefited or made worse by the work; the possible influence of an additional therapeutic measure in the shape of tuberculin or drugs; and the length of the period the patient was under observation, and the number of examinations made during that period.

When patients were not working they were lying on reclining chairs in the open air: This is what is meant by the technical expression, "cure." All the patients had the benefit of fresh air, good food, rest, and hydrotherapy.

Ten patients were for a period on graduated exercise alone, without the addition of any other therapeutic measure except the general hygienic management just mentioned. Seven improved while working. The proportion of lymphocytes was markedly increased in two of these—increased at first and later diminished in two, and decreased in three. Of the latter, the percentages of lymphocytes were 40, 45, and 29, respectively, when the first count was made. In each of these three cases only two counts were made: in one before work was started, and again when the patient was working two hours; in another before work was started, and again when, after rapid increases, the patient was working eight hours, and in the third when the patient was working six hours, and again when he was working ten hours.

Of the three patients who were apparently harmed, or at any rate not benefited, by the work, the proportion of lymphocytes was diminished in two and unchanged in the third.

The curve representing the proportion of polymorphonuclear cells with one and two nuclei (the first two classes of Arneth) sometimes, but not always, corresponded with the curve representing the proportion of lymphocytes. It rose in four of the seven patients who were benefited, fluctuated with a final rise in one, and dropped in two, in one of these but slightly. In the three patients who were harmed or not benefited it rose in one, fell in another, and fluctuated in the third.

Three patients were given tuberculin by mouth in addition to being put on graduated work. Of these, two were benefited and one was not. In the former the percentages of lymphocytes and of the first two classes of Arneth were both at first markedly increased and later diminished. In one of these the lymphocytic curves rose again when the dose of tuberculin, which had been cut down, because believed to be excessive, was again increased. The lymphocytic curve of the third patient at first fell and later rose, the curve representing the first two classes of Arneth taking an opposite and almost symmetrical course.

Two patients were put on graduated work and creosote carbonate about the same time and were benefited. In both the percentage of lymphocytes was at first diminished and later markedly increased, while the percentage of the first two classes of Arneth was first increased and later diminished.

The effect of graduated exercise on the blood-picture did not seem to be influenced by the stage of the disease or by the amount of lung tissue involved.

It must, of course, be borne in mind that work was persisted in only when the patient was improving and that any changes in the blood-picture may have been due to the improvement in the patient, rather than to the method of treatment employed. The improvement in the patient, of course, may have been the result of the treatment, or, on the other hand, may have had no relation to it.

Summary.—Fifteen patients were put on graduated exercise, of whom three were taking tuberculin in addition, and three were taking creosote carbonate. Of the fifteen, eleven improved and four did not. Among the former the proportion of lymphocytes was increased in eight, fluctuated in one, and was diminished in three; the proportion of polymorphonuclear neutrophiles with one and two nuclei was increased in six, diminished in four, and fluctuated with a final rise in one. Among the patients who

were not benefited the proportion of lymphocytes was unchanged in one, fluctuated in one, and was diminished in two; the proportion of the first two classes of Arneth was increased in one, diminished in one, and fluctuated in two.

CONCLUSIONS

Graduated work, given in the proper dosage to the proper patient, tends to produce an increase in the proportion of lymphocytes, especially when this proportion is not already much above the normal.

When the patient is not a suitable subject for exercise, when too much work is given, or when, in addition, too much tuberculin is given, the proportion of lymphocytes tends to become diminished.

The proportion of polymorphonuclear neutrophiles with one and two nuclei (the first two classes of Arneth) does not seem to be affected in a uniform manner by graduated work, although it shows a slight tendency to become increased when work is given in proper dosage to the proper patient.

By observing the effect of graduated work upon the leukocytes of a patient with tuberculosis it is possible to determine whether the auto-inoculation produced is sufficient to elicit the proper immunizing response, or is insufficient or is excessive. In this way it will be possible, with some degree of accuracy, to regulate the proper amount of exercise needed to induce artificial auto-inoculation and consequent immunization.

DISCUSSION ON PAPERS BY DR. RINGER, DR. DUREL, AND DRS. SOLIS-COHEN AND STRICKLER

Dr. H. L. Barnes, Wallum Lake, R. I.: I should like to ask whether it might not be well to examine a certain number of patients who are improving, and yet who are kept on rest? then we could compare these patients with the others who were improving on graduated exercises.

Dr. Ringer: There is obviously something wrong about this Arneth blood-picture, because here we have had three men trying to do things with the most varying systems.

As far as the isthmus proposition is concerned, in our work we regard the isthmus as any strand of nuclear matter that is one-third or more the size of the connecting loops. We have made that an arbitrary rule. I do not know how to account for the discrepancy in all this work. I have not had the experience that Dr. Durel mentioned, in which he says he finds four- and five-cell nuclei in only about 3 per cent. of his cases. There are a great many cases in which we do not find a single cell with five nuclei, but very

few indeed in which there are not several four-nuclei cells. I have used both the Wright and the Jenner stain. I have used them on the same slide, —I mean on smears from the same patient taken at the same time,—and my results have been almost identical. Again, I am absolutely at a loss to explain the results of Drs. Solis-Cohen and Strickler. There must be something wrong either in the method by which we count or in the staining methods we use, and I think the only way to straighten the thing out is for three or four men who are interested in this work to send each other about a dozen slides with cell counts which the other man is to count and compare and find wherein lies the discrepancy.

Dr. Durel: If we need 100 stained slides for comparison, I have that many here, and it would not take long to convince those who are doubtful. This is no subject for projective discussions or theories, but one which we can clear by the examination of a few properly stained blood-smears. I have not reported my observations sooner because I wanted enough material and data on hand before doing so. It is unfortunate that many medical men report their work too soon, and before they find out their mistakes.

What I understand by a division of the nucleus in the blood-cell is that the fragments of the nucleus must be entirely separated, and not bridged by an isthmus band. The variance in the percentage of polynuclear neutrophile leukocytes reported by some writers is, in my opinion, due to imperfect staining of the nucleus in the cell, and to the difference in counting the number of nuclei in the cell. I do not believe that dirt has anything to do with it, as my office and clinic patients make their own slides, and many put their fingers on the slide, but this does not seem to affect the staining of the nucleus in the cell.

With regard to exercise, I have noticed that after violent exercise the blood-picture shifts to the left. Graduated and moderate exercises seem beneficial, for I have noticed many times that the next day after moderate exercises there would be a shifting of the blood-picture to the right. Absolute rest also affects the blood-picture by its shifting to the right. I have noticed this in all newly treated cases. For instance, a patient with a blood count of 92 or more will, after a few days' rest, show a blood count of 80 or 88, the latter remaining so a few days or longer according to the influence of toxic tuberculin products.

Again I want to say that the variance in the percentage of nuclei in the polynuclears is due absolutely to an imperfect staining of the nucleus and to the counting of cells with bridged or connected nuclei as multiple when these cells should be counted as one nuclear cell.

Dr. Solis-Cohen: Dr. Strickler and I are greatly disturbed by the fact that our work is at variance with that of other men in regard to the Arneth count. Different men employ different methods in studying the blood, and do not arrive at the same results. For instance, Minor and Ringer regard nuclei connected by a distinct isthmus as one nucleus. The question is, What do we mean by a distinct isthmus? Three nuclei joined by an isthmus of nuclear substance we regard as one nucleus; when they are joined just by a thin isthmus or filament we regard them as three nuclei. There is great possibility of differing as to the thickness of the isthmus. It would be a good idea to have different men exchange slides and compare results. We intend to do this.

I am interested in the later remarks of Dr. Durel, because, it seems to me, in the polymorphonuclears you always have a slight band connecting various portions of the nucleus, and in the early washing out you may wash out the staining isthmus that joins the nuclei.

In regard to getting very few of the fourth and fifth class, I just looked over nineteen records of patients under tuberculin treatment and found nineteen with no nuclei in the fifth class, and only five with nuclei in the fourth class.

REPORT OF 150 CASES OF PULMONARY TUBERCULOSIS TREATED WITH TUBERCULIN

By Harry Lee Barnes, M.D.
Wallum Lake, R. I.

The material for this report was derived from the histories of 150 cases of pulmonary tuberculosis treated with tuberculin at the Rhode Island State Sanatorium during the five years 1907 to 1912 inclusive. In this series of cases tuberculin was not usually given to incipient or far-advanced patients. The usual type of patient selected was the chronic one whose disease had been arrested or improved, but who was still having tubercle bacilli in the sputum with a moderate amount of signs. Tubercle bacilli were present in 132, or 88 per cent., of all cases either at the onset of tuberculin treatment or previously. Only three or four had cavity signs. In a few cases, however, tuberculin was tried in those who had completely failed to improve under the usual hygienic-dietetic régime and who had sufficient temperature to indicate an active process. The tuberculin was given after the manner advocated by Trudeau, an effort being made to develop tuberculin tolerance by gradually increasing doses with as few reactions as possible. Tenderness at the point of injection, which was regarded as a local reaction, was present at times in the majority of cases. Slight general reactions occurred in 20 per cent. of the cases. There were no severe reactions. Fifty-six of the patients were given watery extract, 40 were given O.T., 37 B.E., and the remainder B.F. The tuberculin books published by the Outdoor Life Publishing Co., recording in detail the prominent symptoms, were used to watch the progress of the cases in many patients who had sufficient education and intelligence to use them. In a few instances the treatment was discontinued because of the onset of temperature or continued loss of weight, yet it was thought proper to include these cases. A large proportion of the patients did not take the treatment as long as advised, as they could see no effect from it. Most of the patients were above normal weight when the tuberculin treatment was begun, yet 91 patients gained an average of 4.7 pounds, while 40 patients averaged a loss of 3.4 pounds. Over 3000 doses

were given, or an average of 20 doses per patient, and the average duration of treatment was sixty days. About half of the patients taking watery extract reached a maximum dose of over ½ c.c. of solution No. 100, many taking a full cubic centimeter. The maximum dose of O.T. was about ⅓ c.c., and the maximum doses of B.F. and B.E. were much smaller. One patient developed pleurisy with effusion, another patient developed tuberculous meningitis, and three cases which had improved little or none on the ordinary sanatorium régime failed rapidly a few weeks after commencing tuberculin treatment, but as such complications and failures occur about as often no matter how patients are treated, they may be regarded as coincidences. In a few cases striking improvement occurred, but equally striking instances occur on the usual sanatorium régime, and on the whole these patients appeared to do neither better nor worse than cases not so treated.

No attempt will be made to review the voluminous literature on the subject, yet it may be useful to point out that many writers have reported too few cases, many without adequate subsequent histories, and many have contented themselves with ascribing improvement to the tuberculin, which may have been due to other causes. Others have allowed their judgment to be influenced by a few striking instances of improvement which follow the use of tuberculin and have forgotten to mention striking instances of improvement which occur without its use. Some appear to labor hard to find something favorable to tuberculin.

In forming an opinion as to whether or not any treatment is beneficial, parallels should be drawn between two classes of patients—those who take the treatment and those who do not, and these parallels should be made from cases that are as similar in prognosis as possible. For this study an attempt was made to match each one of the 150 patients taking tuberculin against another patient of the same classification, according to the National Association, and also anatomically according to Turban and likewise to match only cases having similar records of bacilli in the sputum, temperature, pulse, respiration, general condition, weight, race, and year of discharge. An unsparing logic would also demand that the amount of intelligence and self-control, duration of disease, family infection, amount of sputum, sex, age, duration of sanatorium residence, and many other factors should also be similar, but this was found impossible, as all the available material, comprising about 1500 patients who did not take tuberculin, was barely sufficient to fulfil the conditions first named. There were, however, few marked differences in age, and about 75 per cent. of the cases were matched as to sex. The condition on admission was allowed to stand unless tuberculin was given

a long time after admission, during which the condition had undergone marked change, when the case was reclassified. The length of time patients had fever and the number of febrile attacks were considered of more importance than mere height of the fever. The pulse averages for the first week were the same within ten beats. Respiration was only matched when abnormal, as was also the temperature. Under General Condition were considered not only strength and vigor, but digestive disturbances. No attempt was made to match the exact gain or loss in weight in pounds, but only to match slight or marked changes, or the general tendency. No negroes took tuberculin and none was used for this comparison. Cases were matched against those discharged within a year of each other, except in two instances. To eliminate bias in the selection of cases they were chosen from printed records containing the main clinical facts as to classification, pulse, temperature, etc., but not containing the names of the patients, so that a knowledge of the subsequent histories should not create prejudice. Two or three options were selected in this way, then the names of the patients were ascertained, their charts studied, and the one having the greatest similarity accepted, or, if all were unsuitable, more options were found in the same way. Of course, no pretense is made that the two classes of cases were exactly matched in prognosis, but no pains were spared to carry out the method as completely as possible. Drawbacks to the use of this method are the abundance of material required and the amount of labor necessary to carry it out. While not perfect, it should be much superior to slipshod methods of stating results of treatment, and if widely adopted, it would help to weed out more rapidly worthless methods of treatment in pulmonary tuberculosis. If applied to mooted questions like the "value of climate," it would eventually solve them, as the fruitless war of theories and opinions would eventually be displaced by evidence.

Patients did not, as a rule, take tuberculin until several weeks or months after admission, so that ample records were available prior to the specific treatment.

The condition of the patients on admission is shown in Table I.

TABLE I

	With Tuberculin	Without Tuberculin
Incipient	10	10
Moderately advanced	137	137
Far advanced	3	3
Total	150	150

The condition on discharge is shown in Table II:

TABLE II

	With Tuberculin	Without Tuberculin
Apparently cured	13	11
Arrested	80	51
Improved	38	61
Unimproved	19	27
Died	0	0
Total	150	150

The average duration of sanatorium residence for the tuberculin treated patients was 11.1 months against 5.1 months for those who were not so treated. This difference in the duration of treatment would probably account for the difference in condition on discharge, as many patients who remain only two or three months are steadily progressing toward arrest or apparent cure, which terms nevertheless require time limits, from the last symptoms of activity, of two and three months respectively. Thirty-seven and three-tenths per cent. of the patients who did not take tuberculin remained less than four months, against 2 per cent. of those who took it. About 60 per cent. of the patients have been discharged over four years and 86 per cent. over three years. The present condition of these patients is shown in Table III.

TABLE III.—PRESENT CONDITION OF PATIENTS

	With Tuberculin	Without Tuberculin
Well	47	43
Living and working	14	20
Living	23	19
Dead	66	68
Total	150	150

The tuberculin treated class has 2.7 per cent. more well and 1.3 per cent. fewer dead, but the untreated class has 1.3 per cent. more able to work. The present condition of these two classes of patients is therefore as nearly identical as one could expect it to be if the tuberculin treatment had been entirely without value. The average length of life of those tuberculin treated patients who have died up to this time was 22.1 months from the date of discharge against 14.2 months for those who did not take tuberculin. This extra eight months of life cannot be taken as sufficient evidence that tuberculin prolonged life because the tuberculin treated patients remained in the sanatorium six months longer. In fact, if the tuberculin treated patients

remaining, as they did, six months longer in the sanatorium, had not lived longer, it would have been evidence that the tuberculin actually did harm, because it cannot be denied that sanatorium treatment prolongs life.

Through the courtesy of Dr. von Ruck, who furnished watery extract free of charge, this was given to 56 of the above series. The solutions as furnished were convenient for administration and they seemed more easily given without reactions than some of the other tuberculins, B.E., for instance. So far as known, it gave neither better nor worse results than the others, but as it was given at an earlier period (1907), more time has been allowed for the progress of the disease and death. The patients given watery extract were for the most part moderately advanced cases who had been in the sanatorium long enough to be in good general condition, and the watery extract was given as recommended by Dr. von Ruck.

The classification of these patients as it would have been had they been discharged the day they began the tuberculin treatment is shown in Table IV:

TABLE IV

Arrested	21
Improved	22
Unimproved	13
Total	56

Nearly all those classified as improved were above normal weight and fell but little short of the requirements of arrested cases. The average duration of treatment with watery extract was sixty-five days; the average maximum dose was slightly over ½ c.c. of solution No. 100.

The present condition of these patients is shown in Table V:

TABLE V

Well	15
Living and working	1
Living	4
Dead	36
Total	56

Even when those patients who were classified as unimproved at the initiation of watery extract treatment are excluded from consideration, 53 per cent. of the patients are dead.

CONCLUSION

While other observers using other methods of tuberculin administration and with more prolonged treatment may get different results, as established

by equally thorough statistics, this analysis furnishes no evidence that these 150 patients taken as a whole were influenced by the tuberculin treatment.

DISCUSSION ON PAPER BY DR. BARNES

Dr. John Ritter, Chicago: We ought to have more papers like this. We are now divided pro and con. with reference to the use of tuberculin. We heard yesterday that there are some who have great faith in tuberculin, and today of others that have no faith in it. Papers of this kind will eventually help us out of this chaotic condition. That there is something in the therapeutic use of tuberculin I am convinced—yes, am quite positive of it; but that it cures tuberculosis, I am sure it does not. In treating ambulatory cases, such as are under my care in the city of Chicago, I have seen some good results with the use of tuberculin. I have likewise seen some very bad results. It is difficult to point out in arrested cases what part tuberculin played in the inhibition of the tuberculous process, or in case of death if tuberculin favored the progression of the disease. This is the kind of papers we ought to have more of, so that we may ultimately arrive at a standard tuberculin and know what it is going to do for our patients.

Dr. Silvio von Ruck, Asheville: I am sure Dr. Barnes, in his selection of cases for comparison of results of treatment with and without tuberculin preparations, has exercised every precaution to render the two series as comparable as may be. I grant also that he has approached the question with a mind free from prejudice.

Taking his apparently cured and arrested cases as representative of satisfactory results at the time of discharge, he shows such results in 93 of 150 tuberculin treated cases, or in 60 per cent., and in 62 of 130 cases treated without tuberculin, or in 40 per cent. This advantage in favor of tuberculin he infers may be due to the longer sojourn in the institution of the patients so treated, which is a gratuitous assumption. It does not follow that if the patients who received no tuberculin had remained under treatment on an average an equal length of time, his results in this series would have been likewise 20 per cent. better on discharge.

The use of tuberculin preparations has for its object primarily the induction of an acquired immunity against the pathological action of the tubercle bacillus—*i. e.*, the increase of the specific resistance of the organism against renewal or extension of the specific infection to a greater degree, at least, than that naturally acquired; secondarily, to cause resolution of tubercle which has not already undergone degenerative changes (caseation)

or fibrosis. No more than this is possible of accomplishment. Tuberculin is not a specific for tissue necrosis, and this is what we must, as a rule, deal with in the treatment of our patients, since, unfortunately, a pulmonary tuberculosis does not unequivocally manifest itself until the disease has advanced to this stage, and therefore ordinarily the diagnosis is not made earlier.

To this stage practically all Dr. Barnes' cases had progressed, since he tells us that 95 per cent. of them had tubercle bacilli in the sputum.

While we may look to tuberculin preparations to increase resistance against further infection and to bring about resolution of recent non-degenerated tubercle, we must depend upon general measures to combat the end results, *i. e.*, the effects of destructive processes, tissue necrosis, suppuration, etc., for which there is no specific. If these features of the individual case may be successfully dealt with, then it is not a matter of indifference that the patient be protected by artificial immunization against extension of infection and production of new tubercle, which must ultimately lead to additional tissue necrosis and its natural consequences.

Dr. Barnes submits no evidence that he has produced immunity in his tuberculin treated cases, as may be shown by examination of the blood for specific immune bodies, but could it be assumed that not a single virulent tubercle bacillus existed in the tissues of his tuberculin treated patients at the time of their discharge, there would be no valid reasons why they should not subsequently have succumbed to renewed destructive changes in latent necrotic foci, to the effects of other infections, complications, etc., in the same proportion as he has told us was the case in the series treated without tuberculin.

That he has proved anything for or against tuberculin preparations, or that they are without influence, does not follow from his statistics of comparison of the ultimate fate of his patients after discharge.

Why? Because he has been dealing with phthisis and because the class of patients whose social status renders them a public charge are forced to return to their previous unfavorable environment, where the natural struggle for existence, overwork, poverty, exposure, perhaps insufficient food, etc., must necessarily militate against the maintenance of a state of arrestment or a lasting recovery from the former active phthisis.

Dr. Frederick Smith, Fort Stanton, N. M.: If the therapeutic efficiency of tuberculin is ever accurately determined, it must be done in some such way as Dr. Barnes has done it. It is not the man who gives tuberculin to all his cases who has any special claim to our confidence in the matter,

because the opinion of the man who has always given tuberculin to all his cases is not worth anything. The man who gives tuberculin to none of his cases would have an equal right to an opinion on the subject.

At Fort Stanton, the 34 cases which we reported in last year's Transactions of this Association were those who had been under treatment for a year previously and also subsequently, as well as during the tuberculin treatment. In that way we were able to compare the effects of climatic treatment with and without tuberculin, and to watch the subsequent results. The medical officers who did the work unanimously agreed that there is no evidence that tuberculin in any way influenced the general course of the disease in any of our patients.

Dr. Wallace J. Durel, New Orleans, La.: I had no idea of entering this discussion, but what I wish to say and to see brought out is that we should tabulate cases treated without tuberculin, and an equal number who have failed with tuberculin or who have not been treated with tuberculin.

All these cases must necessarily follow the same hygienic and dietetic treatment, and must all have been treated for a specified time.

It seems that by next year we should demand from those who believe in tuberculin, as well as from those who do not believe in tuberculin, that they show statistical reports, whether tuberculin is of much value in the treatment of tuberculosis.

I have taken scores of first-stage cases at a time when I did not believe in tuberculin as much as I do today, and treated these cases without tuberculin. It is to be noticed that those cases so treated did not improve as fast and were not in as many instances arrested as the tuberculin treated cases of whom 93 per cent. were arrested.

No one who has used tuberculin carefully by daily observations of his patients, by daily examinations of the blood-pictures, by following the sputum of his patients, can deny the efficiency of tuberculin.

I believe that tuberculin is the most important adjunct in the treatment of tuberculosis when administered by specially trained men; and condemn its use absolutely when given by the inexperienced and unskilled men.

Why do we consider exercise so valuable in the treatment of tuberculosis? Why do we preach the value of exercise and rest and open air and diet in tuberculosis? Because the leukocytic count is affected by the above measures. We know today that tuberculin also affects the leukocytic count, and that it is the best "whip in hand" which we have to stimulate the bone-marrow cells to activity, so producing the necessary supply of new and matured leukocytes.

We must not expect grand results from tuberculin alone, for, remember, tuberculin is only an accessory to the basic hygienic-dietetic treatment. Let us remember also that other remedial measures have their place of value on the list of accessories for the treatment of tuberculosis.

Finally, I will say that my patients treated with tuberculin do not relapse as frequently as the non-tuberculin cases.

Dr. Barnes: In the first place, let me protest against any one saying that I am an enemy of tuberculin administration. I have been enthusiastic in favor of tuberculin in diagnosis. I use it and advocate its use. I am not an enemy to the use of tuberculin as a treatment. I hoped I would get results. I hoped I would not be swayed in my judgment by impressions that might be given, but that I would state the naked facts and let them speak for themselves. This is what I have tried to do.

Dr. von Ruck says that the tuberculin-treated patients were better in reference to condition on discharge, but he apparently forgot to note that a large percentage of the non-tuberculin-treated patients did not remain four months. When you have a three months' time limit necessary in the apparently cured class, and a two months' limit in the disease-arrested class, will this not account for these differences on discharge? The end-results are more significant than the results on discharge. He says we could not expect tuberculin to cure cases in which tubercle bacilli were found in the sputum. That is the condition in which a large percentage of all patients come to the sanatoria, or that come under treatment elsewhere. If tuberculin cannot help these cases, its usefulness is seriously limited. He also speaks of the fact that our patients were poor. Accordingly, when they left they were likely to relapse, but those who had tuberculin were just as poor. I know that in general those who took tuberculin had neither much better nor worse conditions to go home to than the others.

Dr. Durel seems to shift the burden of proof on those who are skeptical in regard to the use of tuberculin. The burden of proof is on the man who uses tuberculin, as he must furnish careful logical and correct statements and accurate statistics that it is a decided benefit.

Dr. Durel: I do not want to be accused of throwing the burden on the other side. On the contrary, I say, let us all go to work and furnish statistics and them compare them.

PATHOLOGICAL SECTION

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New York

ACID AGGLUTINATION OF TUBERCLE BACILLI*

By Charles Krumwiede, Jr., M.D.
New York

Michaëlis, in the "Deutsche medizinische Wochenschrift," No. 21, 1911, calls attention to the fact that colloids and bacteria have specific points of precipitation in acid solutions, depending on the degree of hydrogen dissociation. The following table gives an example of the preparation of a set of solutions:

Solution	1	2	3	4	5	6
Acetic Acid $\frac{N}{1}$	7.5 c.c.	10 c.c.	15 c.c.	25 c.c.	45 c.c.	85 c.c.
Sodium Hydroxid $\frac{N}{1}$	5 c.c.	5 c.c.	5 c.c.	5 c.c.	5 c.c.	5 c.c.
Water	87.5 c.c.	85 c.c.	80 c.c.	70 c.c.	50 c.c.	10 c.c.
Ionization	1.10–5	2.10–5	4.10–5	8.10–5	16.10–6	32.10–5

The test is performed by making a suspension of the bacteria in distilled water. Three cubic centimeters are added to six tubes and the above six solutions added in 1 c.c. amounts. With typhoid and paratyphoid the following is an average reaction:

Solution	1	2	3	4	5	6
Typhoid	—	±	+	+	±	—
Paratyphoid	—	—	—	—	+	+

Michaëlis stated in his first examination that tubercle bacilli were alike in having their maximum agglutination at a hydrogen dissociation of 0.6 . 10–3, and this was the same for each type. He did not mention the range of agglutination, however.

In a later article Beniash ("Zeitschrift für Immunitätsforschung," vol. 12, p. 304) gives the following table. The mixtures were made with lactic acid and sodium lactate. The medium on which the bacilli were grown is not stated.

* From the Research Laboratory, Department of Health, New York.

Ionization of Solution	1.7.10–5	3.5.10–5	0.7.10–4	1.38.10–4	2.76.10–4	5.5.10–4	1.1.10	2.2.10–3	4.4.10–3
Human 1	—	—	+	+	++	++	++	+	±
" 2	—	—	—	±	±	+	+	±	±
Bovine 1	—	—	±	±	++	++	++	±	±
" 2	—	—	—	—	±	±	±	—	—
" 3	—	—	—	±	±	+	++	±	±
Avian	—	—	—	±	±	+	±	—	—

We had tried some preliminary tests with bovine and human strains, using the solutions given in the first table. These showed a difference in the range of agglutination. There were on hand the dried bacteria filtered off from heated broth cultures. These had been stored in the dry condition for several months up to a year or longer. Having only a limited number of fresh strains, the dried bacilli were ground up and suspensions prepared. As controls, fresh cultures, both heated and unheated, were used. Before making the suspension the bacilli were thoroughly washed with distilled water. The results were as follows:

Solution	1	2	3	4	5	6
Ionization	1.10–5	2.10–5	4.10–5	8.10–5	16.10–5	32.10–5
Bovine type:						
1 strain	—	—	—	—	+	+
3 strains	—	—	—	±	+	+
4 "	—	—	—	+	+	+
Control heated	—	—	—	+	+	+
" unheated	—	—	—	±	+	+
Human type:						
4 strains	—	±	+	+	+	+
7 "	—	+	+	+	+	+
2 "	±	±	+	+	+	+
12 "	±	+	+	+	+	+
Controls: 5 strains heated and unheated	Same range as preceding.					

These results held on repetition with some of the same suspensions. The readings were made after one to two hours at room temperature. Readings were controlled by allowing the tubes to stand on ice over night. After this they were gently inverted to rule out spontaneous sedimentation. A moderately thick but translucent suspension was used.

The following table shows these irregularities sufficiently:

Solution	1	2	3	4	5	6	Notes
Ionization	1.10–5	2.10–5	4.10–5	8.10–5	16.10–5	32.10–5	
Human type: No. 305	—	—	+	+	+	+	Same cultures throughout.
" heated	—	+	+	+	+	+	
" dried	—	—	—	—	+	+	
" " and heated	—	—	—	—	—	±	
No. 470	±	+	+	+	+	+	" " "
" dried	—	—	—	—	—	—	
"	±	±	+	+	+	+	" " "
" heated	—	—	—	—	±	+	
" dried	—	—	—	+	+	+	
" " and heated	—	+	+	+	+	+	
Bovine type: No. 311	±	+	+	+	+	+	" " "
" dialyzed	—	±	+	+	+	+	
" " and dried	—	—	—	+	+	+	
	—	—	—	—	+	+	
No. 536 dried	±	+	+	+	+	+	" " "
" " and heated	±	+	+	+	+	+	
Ravenel H.: Heated and unheated	+	+	+	+	+	+	Flocculation in control. Same result with filtered suspension.
Ravenel H.: Dried	—	—	—	+	+	+	Different culture than preceding.
No. 490	—	—	—	±	+	+	Same culture.
" heated	—	—	—	±	+	+	
"	—	—	±	+	+	+	Same culture.
" dialyzed	—	±	+	+	+	+	
" " and dried partly	—	—	—	+	+	+	
" dialyzed and dried	±	±	+	+	+	+	

The following are some tests of cultures from other media than broth:

Solution		1	2	3	4	5	6	Notes
Ionization		1.10–5	2.10–5	4.10–5	8.10–5	16.10–5	32.10–5	
Avian type: A. Glycerin-agar		—	—	—	—	—	±	Only after 15 hours.
" " "		—	—	—	+	+	+	
B. " "		—	—	—	—	±	±	
" Glycerin egg		—	—	—	—	±	+	
" " "		—	—	—	±	±	±	
" " "		—	—	—	—	—	±	Only after 15 hours.
C. Glycerin egg		—	—	—	—	—	±	Flocculation in 4 and 5 after 15 hours.
Human type: No. 667	Glycerin egg	—	—	—	+	+	+	
No. 814	Glycerin egg	—	—	—	+	+	+	
Dowd.	Glycerin egg	—	±	+	+	+	+	
H. 1	Glycerin egg	—	—	—	—	±	±	Very slow.
	Glycerin egg	—	—	±	+	+	+	
H. 3	Glycerin egg	±	±	±	±	±	±	
Bovine type: No. 8		—	—	—	—	—	+	
No. 490	Glycerin egg	—	—	+	+	+	+	
No. 123	Glycerin egg	—	—	±	+	+	+	Slight sedimentation in tubes 1 and 2.
No. 122	Glycerin egg	—	—	+	+	+	+	Slight sedimentation in tubes 1 and 2.
B. 1	Glycerin egg	—	—	±	+	+	+	Slight sedimentation in tubes 1 and 2.

Meanwhile fresh cultures of the available strains were planted and tested. These results have been different and show no uniformity, even with the same strain on successive tests or with different cultures of the same strain. Where no mention of media is made, the cultures were on broth. When the results were found to be irregular, various factors were introduced to approximate the conditions in the first series, as drying, heating, or both. The dried tubercle bacilli had been washed by pouring distilled water on the masses of bacilli and changing once or twice daily for several days. It

was thought that washing of the fresh cultures on filter-paper was not as thorough as this, and that the first test was really made with dialyzed bacteria. To approximate this some cultures were dialyzed.

Under one set of conditions with dried tubercle bacilli where the test was carried out as one series, a uniform difference was noted between the human and bovine types. With fresh cultures this difference disappeared. An attempt to approximate the original conditions gave varying results. Drying the bacilli had an influence on the range of flocculation, but on both human and bovine types. Heating gave irregular results. The only factor not tried was the time of storage of the dried bacilli. Whether these uniform results could be reproduced with old dried cultures cannot be answered. The fluctuation in range of the three types, with fresh cultures at least, is much the same and therefore of no value in differentiation.

SOME OBSERVATIONS ON TUBERCULOUS CATTLE

By Charles F. Briscoe, A.M., and W. J. MacNeal, M.D.
Urbana, Ill. New York

The investigations upon which this paper is based were carried out at the Illinois Agricultural Experiment Station in 1908, 1909, and 1910, and have been presented in detail in Bulletin No. 149 of that station. The work there was fairly comprehensive in plan. At this time we merely desire very briefly to direct attention to the results of some of the studies upon the animals of the university herds.

The cattle which formed the principal objects of study were—(1) The university dairy herd, especially that portion of it which had reacted to tuberculin; (2) certain individuals of the beef herd which had reacted to tuberculin; and (3) certain neighboring small herds owned by private individuals and shown to be free from tuberculosis by the tuberculin test. The study of these cattle included—(1) The examination of their milk; (2) the examination of feces; (3) examination of blood; (4) examination of the carcass after slaughter.

The tests of milk from the tuberculous dairy herd fall into three categories: First, the mixed milk from the thirty-five tuberculous cows taken collectively was sampled and tested on eleven different occasions, always with negative result. Second, the milk from each of three cows was tested individually on two occasions. These three cows were selected as apparently the most advanced cases of tuberculosis in the dairy herd. All the tests gave negative results. Third, milk from each quarter of the udder of six tuberculous cows was tested separately. These six cows had been selected for early slaughter because they were practically no longer profitable, and these detailed examinations were performed so that the results might be compared with the postmortem findings. All these tests gave negative results. As having a bearing upon these negative results, it may be mentioned that none of the animals showed any evidence of tuberculosis of the udder at autopsy. Indeed, no case of tuberculosis of the udder was found in the herd during these investigations, and there were never any badly emaciated animals in it. Furthermore, the dairy equipment and dairy methods were those of an

agricultural college and experiment station, intended to serve as a model of excellence.

Especial attention was directed to the examination of the feces of the cattle because of the usual admixture of such material with ordinary milk, and because of the work of Schroeder and Cotton and others, indicating the frequent presence of tubercle bacilli in the feces of tuberculous cattle. The bacilli were searched for by two methods—by means of the microscope and by inoculation of guinea-pigs.

The microscopic examination included the study of four slides, one smeared with mucus from the exterior of the mass of feces, a second smeared with mixed feces, a third smeared with the fecal bacteria separated by means of the centrifuge, and a fourth smeared with material scraped directly from the mucous membrane of the rectum of the cow. Each slide was studied microscopically for fifteen minutes and the number of acid-proof bacilli morphologically indistinguishable from bovine tubercle bacilli was recorded. Only a few were found on any of the slides, but whenever such organisms were detected on one or more slides, the result of the examination was recorded as positive. One hundred and nineteen samples were examined from 35 reacting cows. A positive result was obtained 53 times and a negative result 66 times. Of the 53 reacting cows tested, acid-fast bacilli were found at some time in all but 19. Of these 19, 9 were examined only once, 9 twice, and 1 four times. In a similar way 18 cows which did not react to tuberculin were examined. Of 40 samples from these, 23 gave positive results and 17 were negative. Fifteen of the 18 cows gave positive results and only 3 were negative at all examinations made. Of these 3, 2 were examined twice each and the other only once. From these results it would appear that the microscopic finding of a few acid-fast bacteria in the feces of cattle has no relation to the existence of tuberculosis in such cattle.

Inoculation of laboratory animals proved to be a much more reliable method of detecting the presence of tubercle bacilli. It was shown by experiment that a dose as small as one hundred millionth of a milligram of culture of bovine tubercle bacilli (0.00000000001 gram, or 1 gram $\times$ 10^{-11}), suspended in salt solution or mixed with cow manure, was sufficient to produce tuberculosis in guinea-pigs. The test was, therefore, delicate. Erroneous positive results were avoided by using guinea-pigs, animals in which, so far as we know, tuberculosis does not occur naturally, and by inoculating animals in series and making cultures from every apparently tuberculous guinea-pig. One cubic centimeter of a 1 per cent. suspension of feces was injected subcutaneously into each of two or three guinea-pigs for each test.

The first series of inoculation tests was made between December 28, 1908, and January 4, 1909, and 38 cows, comprising the reacting herd, were tested at this time. Two of the 38, namely, No. 1004 and No. 83, were found to be passing virulent tubercle bacilli in the feces. The postmortem examination of these cows (State inspection at Chicago) showed tuberculosis of the lungs, bronchial lymph-glands, and mediastinal lymph-glands in both animals. The carcasses were passed as fit for food.

The second series of tests was made in August, 1909, and at this time a third animal, No. 56, was found to be passing virulent tubercle bacilli in the feces. This animal had been tested on December 31, 1908, by inoculation of two guinea-pigs, both remaining negative when chloroformed after fifty-three days; again on August 9, 1909, with similar result. On August 31, 1909, two guinea-pigs were inoculated and both became tuberculous, the disease was transmitted to other guinea-pigs in series, and the organism was obtained in cultures. On October 4, 1909, two more guinea-pigs were inoculated with feces of this cow, and these remained free from tuberculosis when killed after fifty-three days. Another test on November 13, 1909, also gave a negative result. The final test on this cow, August 16, 1910, resulted in tuberculosis in one guinea-pig, but none in the other. At the postmortem examination of Cow 56 (at Urbana) tuberculosis of the lungs, liver, bronchial lymph-gland, and mesenteric lymph-glands was found. The interior of the intestine was not examined. The carcass was condemned. This case seems to us to be important as an illustration of the difficulty of detecting with certainty the cow which is excreting tubercle bacilli.

The blood of eight tuberculous cattle was examined for tubercle bacilli. The blood was taken in an aseptic manner from one of the superficial abdominal veins and was mixed with sodium citrate to prevent clotting. Forty c.c. of citrated blood was laked with distilled water, centrifugalized, and the sediment repeatedly washed with distilled water. Part of the sediment was then stained and examined microscopically, and the remainder was injected into two guinea-pigs. The results were uniformly negative.

Fifty-eight of the reacting cattle used in this study were slaughtered. Seventeen were killed at Urbana and the carcasses personally inspected. Tuberculous lesions were found in all of them and seven were condemned. Forty-one were slaughtered at Chicago. Tuberculous lesions were found in only twenty-four, and of these only one was condemned. In seventeen carcasses lesions of tuberculosis were not detected. Tuberculosis of the udder was not found in any of the animals.

CONCLUSIONS

The results indicate that well-nourished cows which react to the tuberculin test but otherwise appear normal do not commonly pass tubercle bacilli in their milk. Furthermore, under good conditions of dairy management tubercle bacilli are not likely to be found in the milk of such cows when it leaves the dairy. A certain number of such animals, however, are, in spite of their healthy appearance, passing virulent tubercle bacilli from their bodies and are, therefore, a constant menace to everything in their environment. So far as we know, there is no practical means of distinguishing between these dangerously tuberculous cattle and those which merely react to the tuberculin test, but are not excreting the bacilli. The blood-examinations show conclusively that tubercle bacilli do not commonly circulate in any considerable numbers in the blood of cattle in the earlier stages of tuberculosis naturally acquired.

Our results differ somewhat from those of other workers, notably Ernst, and Schroeder and Cotton in this country, and Rabinowitsch and Kempner in Germany. On the other hand, they are in accord with the previous extensive and careful work of Ostertag and of Smit. The apparent discordance of results of different investigators seems to be due in part to differences in methods, some of which are probably not reliable, but also in part to differences in the bovine animals studied. The animals which we have studied were well housed, well fed, and cared for in a manner intended to serve as a model of dairy husbandry. Emaciated and manifestly unhealthy animals were not retained in the herd. The conditions would seem, therefore, to represent the minimum of danger to be encountered in dealing with cows which have reacted to tuberculin. Yet under these conditions animals excreting tubercle bacilli were found in the reacting herd whenever a systematic search for them was made. The well-recognized necessity for segregation of reacting cows and pasteurization of their milk before it is used as food for other animals or for man is in no way diminished by these observations. In fact, it would seem that the only means of controlling bovine tuberculosis must rest upon either an effective segregation of animals which react to tuberculin or else their immediate slaughter.

DISCUSSION ON PAPER BY DRS. MacNEAL AND BRISCOE

Dr. Clyde E. Cotton, Black Mountain, N. C.: Dr. MacNeal seems to have been laboring under a misapprehension as to Dr. Schroeder's work and my own regarding examination of the feces. We did not rely on the microscope. We simply used the microscopic findings as a guide and

checked the work up by guinea-pig inoculations. If he had read our work carefully, he would find that we not only produced tuberculosis by inoculation and feces, but by mixing the feces with milk and injecting the milk. It would be ridiculous to call every acid-fast bacillus a tubercle bacillus. We know there are any number of varied bacilli like tubercle bacilli, and I think if he will read our work carefully again, he will find that we examined the feces of a great many healthy cattle that reported to the station, but we did not find acid-fast bacilli, but simply isolated acid-fast bacilli from numerous other tubercle bacilli. We never claimed very much for the microscopic test of the feces. I wish also to say that in cattle in which we found acid-fast bacilli, those that came to autopsy, we examined the intestines very carefully. In some instances we found lesions, such as tuberculous ulcers, but in many of these cattle in which we got positive tests by guinea-pig inoculations we found absolutely no lesions in the intestines themselves.

Dr. M. P. Ravenel, Madison, Wis.: In regard to the work of Rabinowitsch and Kempner, I do not think it can be fairly compared with other work along the same lines for the reason that their protocols show that a number of the animals had tuberculosis of the udder. In the beginning of my work I believed that the bacilli penetrated the intestine, particularly during digestion of fat. To my surprise and pleasure I found that Orth, of Berlin, stated that when tubercle bacilli were mixed with normal salt solution and then injected into the rectum of guinea-pigs tuberculosis rarely took place, while, on the contrary, if they were mixed with fatty material, infection usually occurred. This agrees with the stand which I had taken several years previously. However, the physiologists told me that I was mistaken in my views; that fat was broken up by a fat-splitting enzyme into glycerin and fatty acids, which passed through the intestine by osmosis, when they were recombined by the reversed action of the enzymes. This may be true, but it seems to me that it has been abundantly demonstrated, first, by the work of Desoubrey and Porcher at Nocard's laboratory, that the digestion of fat has something to do with the passage of bacilli through the intestinal wall. These authors, at the suggestion of Nocard, examined dogs, first, after feeding with bouillon entirely free from grease, and, second, other animals after having been fed with a greasy soup. They did not work with tubercle bacilli, but found that when dogs were fed on a grease-free bouillon, very few bacteria could be found in the chyle of the thoracic duct. On the other hand, animals which were fed a greasy soup showed the presence of large numbers of bacteria in this same fluid during digestion. Schlossmann

and Engel, Reichel and myself, and others have also shown that during the digestion of fat tubercle bacilli pass rapidly through the intestinal wall and may be found in the lung of the animal within five hours, the passage apparently taking place in the chyle through the thoracic duct. In spite of what the physiologists say, I still believe that during the digestion of milk the tubercle bacilli pass from the intestine into the circulation, and that the danger to children is from taking milk infected with tubercle bacilli.

Dr. MacNeal: I am very sorry if I cast any reflection on the work of Dr. Schroeder and Dr. Cotton, as I assure you I had no desire to do so. The impression went out from their report, as I recall it, that the microscopic test was of some value. We found it to be of no value. Your animals [referring to Dr. Cotton] which gave negative results did not react to tuberculin, while in those which did react to tuberculin you found acid-proof bacilli in the feces. I grant you, conservatism was displayed in your article in drawing your conclusions, nevertheless one would get the impression that the microscopic test was of considerable value. It was of some value if you found large clumps of bacilli in your cases. The finding of a few acid-fast bacilli, however, has no necessary relation to the presence of tuberculosis.

The other point raised was in regard to the presence of lesions in the intestine. Of course, you can get tubercle bacilli in the feces of cattle, which are derived from lesions in the lungs. That is the chief source from which the tubercle bacilli come. The material does not come out of the mouth: it is swallowed and passes down, and virulent tubercle bacilli are found in the feces. It is probably the chief danger in herds of the kind we were working with, that is, where a herd is kept up to the proper grade of nutrition, and all evidently diseased animals are immediately excluded; and that is according to Professor Bang's method of treating tuberculous cattle. In this kind of animals, even where you have the best conditions, you cannot avoid the danger of contamination through feces.

Dr. Clyde E. Cotton, Black Mountain, N. C.: I am sorry if the impression has been conveyed that we advocated this method of isolating or sorting out tuberculous animals. We never intended that. We pointed out that tubercle bacilli were eliminated in the feces and did get into the milk in that way, and that hogs fed on the feces of cattle contract tuberculosis in this way, and that is the only thing we attempted to show.

I regret very much if any one has been led astray and has been trying to use this method of testing tuberculous cattle.

LIME ASSIMILATION AND TUBERCULOSIS

By Ira Van Gieson, M.D.,
New York

This is a brief and initial account of an experimental test of Russell's Generalization in Tuberculosis. In two papers* in 1909 Dr. John F. Russell, of New York, announced the culmination of years of investigation in the recognition of lime starvation as an essential cause of tuberculosis. The first paper gives an outline of the theory of lime starvation and a preliminary account of its application in the treatment of tuberculosis. In the second paper is presented a full discussion of the sequence of events in lime assimilation, and a further extension of the range of its phenomena. Russell's hypothesis, as he guardedly chooses to call it at its début, is twofold. To begin with, there is the recognition of lime starvation as the determining or efficient cause of tuberculosis. Secondly, there is the exposition and explanation of lime assimilation. This is complex. Russell's mental methods in plotting out his studies seem to have been largely influenced by the *a priori* type of investigation. He undoubtedly conceived that tuberculous infection, being quite universal, the differences in the behavior of human beings to the infection might be due to differences in that great fundamental factor in organic life in general—diet, assimilation, food supply. After years of experimental work with several of the cardinal elements of diet, he narrowed down and assumed that lime deprivation might be this differential factor in tuberculosis.

Now the assumption or even recognition of lime starvation as the efficient cause of tuberculosis is a valuable hint and clue, but it leaves us quite as helpless and no better off than before. With the assumption of lime deprivation the question is only stated. A field of inquiry is outlined. The real task and problem still remain; because, unless we understand a mechanism, we cannot expect to control it. So the assumption of lime starvation as the precursive or governing factor in tuberculous infection

* John F. Russell, "The Treatment of Pulmonary Tuberculosis Based on the Assumption that the Dietetic Cause of Disease is Lime Starvation," New York Medical Record, Nov. 27, 1909, and Dec. 18, 1909.

is a valueless treasure or one of only potential worth until we know how lime starvation operates; until we have a generalization assembling the events which mark its course and sway.

And, indeed, this is just what experience relates. Lime starvation in tuberculosis has been suspected and the hint acted upon often, in a casual way, for a hundred years past. Nothing ever came of it in practice, nor are we any better off in theory. Far from it. These foregoing guesses about lime starvation and the empirical feats in trying to correct it without understanding the modus operandi of lime assimilation have served only to put the whole subject in the background, and, still worse, to give it the brand of having been tried with failure.

Even to this day the notion still prevails that lime starvation is so crude and simple a transaction that all we have to do in its correction and counteraction is to prescribe calcium salts and give lime as a drug. But it does not work. In a previous article,* both by reasoning and experiment, I tried to show that calcium medication in the present state of synthetic organic chemistry is no equivalent or substitute for lime assimilation, except perhaps in a feeble and insignificant degree. This statement refers more particularly to calcium medication in experimentally tuberculous guinea-pigs and rabbits, and lime assimilation experiments in tuberculous dogs.

Thus the real essence and important value of Russell's investigation is that which tells us about the nature and operation of lime assimilation—in brief, its explanation. By the explanation of lime assimilation is meant a plotting out of the sequence of events therein; its *rationale* and its *modus operandi*. This gives the key to lime starvation, discloses a new and unrecognized range of phenomena; puts the fields of lime starvation and their attendant or sequential ills under human control and management, and bequeaths a new and extensive domain of practical application and therapy treatment and preventive medicine.

Russell's hypothesis is no longer in a tentative stage. It has abundant confirmation and comprehensive grounds of verification. Any hypothesis assembling a great range of unknown or obscure phenomena, predicting the existence of still other phenomena, which works out true; which stands the test of practical application and treatment; meets the ordeal of crucial experiment—deserves the rank of a generalization. The province of tuberculosis is badly in want of a new and broader viewpoint.

* Van Gieson and Lynah, "Creosote and Calcium Medication in Respiratory Affections in Children and in Pulmonary Tuberculosis," Russell's "Generalization in Tuberculosis," New York Medical Record, May 11, 1912.

I think—if conscientious study of evidence will not be mistaken for personal enthusiasm—that Russell's investigation is one of the most important, far-reaching, and most beautifully worked-out generalizations in medicine for the past three decads, because it seems to strike at the root of tuberculosis rather than at its seed, and in subsequent papers I may perhaps be able to find expression for the conviction that the trouble with the present view of tuberculosis is that it detaches only a portion of the phenomena of the disease process and makes believe that this is the whole. Thereby is neglected a great range of events which are forerunners and forecasters, as well of the career of the tubercle bacillus as of the destiny of him who has them. It must be apparent to any one who will reflect beneath the surface of the matter that all this work on the bacillus alone does not tell us a word about the antecedent stages of the disease. But what we are, and should be concerned with, are the assemblage and sequential order and relationship of the steps of the whole disease process itself. It seems difficult to accomplish this by too great a restriction of study and view upon the bacillus. This bacillus is an organism which steps in and continues its work only after an antecedent succession of events are well on their way and course.

I had hoped, in devoting two years to the examination of Russell's generalization, to accomplish two purposes: First, to try and weigh its soundness and validity, and then, perhaps, to add some confirmation and evidence; fit in a piece or two in the expanding mosaic of the generalization, but mainly the motive was in this examination, to act as proxy, as it were, for bedside physicians who should be the guardians of the consumptive and undertake the responsibility of helping to put the matter at the disposal of and for the good of both. There are so many short cuts nowadays away from the bedside and the real phenomena of disease that we have more need of criticism for a time than of new discoveries, claims, and conquests which come so quick and fast that it is rather difficult to keep track of them. Plainly, the safe way is neither to dismiss them too arbitrarily nor to take them too easily on faith, but to go over the evidence just as carefully as their exploiters—and perhaps in many cases a little more so. But this is manifestly impossible for the practitioner or any one else.

However this may be in trying to stand sponsor for this generalization, there is no attitude of laying down the law or settling the problem, nor, indeed, even fault finding, of the prevailing view of tuberculosis, but the presentation of evidence. Indeed, although warranted by evidence in having certain definite beliefs and conclusions about Russell's generalization, there

is no desire to be insistent about expressing them, because this evidence speaks for itself. And then, besides, still further evidence remains to be presented which all fits in with the mosaic, and upon the presentation of this attendant corroboration in other fields it will be time to sum up the case, as the lawyers say, after the evidence is all in. This may seem like an attitude of competency which, since so voluntary, might be reminiscent of *timeo Danaos*. The gift-horse has been presented a good many times in tuberculosis, with all his traditional infirmities. But we are somewhat relieved of undue presumption of competency, since this may be put on the shoulders of experiment. It is the evidence which is competent.

The first year of this examination was spent in Dr. Russell's clinics, watching the effect of lime assimilation in the treatment of pulmonary tuberculosis carried out systematically and persistently. However it may be elsewhere, there are no short cuts to the apprehension of the phenomena of tuberculosis in living cases, at the clinic, nor in the observance of attempts to reverse these phenomena. I watched these patients week by week and month by month. There seems to be no way of cheating time nor any easy abbreviated or casual way of getting this experience. I saw these ambulatory patients improve, arrest the tuberculous process, and to all intents and purposes get well. And there were too many of them to think that they would have gotten well if left to their own devices.

Then I tried out this factor of lime assimilation independently, and in my own private practice, having the benefit also of the experience of two of my friends, Dr. Carlin Philips, of Bellevue Hospital, and Dr. Jesse Bullowa, of New York, whom I interested in this matter. The same results occurred as in Russell's clinics. And so far there have been only two exceptions in the response to a protracted régime of lime assimilation. One of these cases was complicated with carcinoma of the pyloric region, diabetes, and Bright's disease. The second case was almost hopeless at the beginning, with pulse around 120, temperature reaching 103° F., and extreme pulmonary involvement. But even in this latter case we believe that her life has been prolonged for nearly a year, and that she may even yet continue to live. And, by the way, this experience provides the opportunity of answering this criticism of "selected cases" in Russell's clinics, if, indeed, it be worth while—for this is not criticism, but cavil and loose gossip. The insinuation, of course, is that the generalization has been bolstered up by choosing the most advantageous cases, and thereby working in the fictitious support of spontaneous recovery. It is hard to understand how, when two years were spent in the examination of this generalization before saying a single

word about it, physicians can talk about "selected cases" when they have never witnessed any of Russell's work or have ever been anywhere near the scene of its action in his clinics. It is a fine example of disregard of the ethics of belief. And still it is natural to suspect spontaneous recovery in the midst of these many claims for the control of tuberculosis, for tens of thousands all over the world are recovering by their own devices under no special favor of fresh air. Very naturally during this time devoted to the clinical verification of the lime assimilation generalization its experimental ordeal was considered. For it is essential to subject theories of the nature of tuberculosis to experimental tests before too confidently noising them abroad.

The consideration of tuberculosis, it seems, is as pessimistic in the concrete and in practice as it is buoyant in the abstract and in theory.

But the sinister outlook in the minds of practitioners for the reversal of the steps in tuberculosis—I hope I am mistaken about it—is really not justified, although reasonable enough from our many disappointments and false hopes. Nature has found a very precise and definite way of taking care of this universal infection, preventing the destruction of the human race, and redeeming nine-tenths of them. These she puts among the fit. How are they fit? Another tenth are found unfit and are dismissed with the infection. And how is it also that these are unfit? For in the beginning, as far as the bacilli are concerned, they both stood on an equal footing. The bacillus does not vary, for when found in our tissues, they are uniformly virulent. The survivors then are the beneficiaries of some secret favor, so nicely adjusted, so beautifully contrived, that they are not even aware of any effort, silently working out their salvation. So long, then, as this is going on nearly everywhere, and every day and hour, in the whole human race, we can take a more hopeful view of the situation. For aside from research for the moment, as said in a previous article,* it would seem that common sense might dictate the way to get at this problem, which is to find out how nature manages to get this splendid percentage of recoveries, imitate it, and put it at the disposal of the consumptive. This method of nature in her way of planning out the recovery from tuberculosis is not loose or haphazard, but, on the contrary, very definite, precise, and sure. She has a mechanism of some kind, which we do not seem in the least to understand.

Evolution, the master physician of the human race, understands tuberculosis perfectly. Do we get any such splendid percentage of recoveries in any disease so serious as tuberculosis? In the survival of the fittest,

*Van Gieson and Lynah.

evolution faces the bacillus boldly, for she has a way of making it harmless. Her business is not to avoid infection,—she knows better,—for this is futile. She takes for granted and presumes that every one is or will be infected. Infection is a foregone fall-down conclusion. Her business is not looking out for sources of infection, but to prevent it from breaking out and going on.

I am sure that measures to promote lime assimilation in tuberculosis can do no possible damage. These measures are not onerous, either for patient or physician or in prophylaxis. On the contrary, they are very simple, and I am equally impressed with the good and betterment that can be done by this consideration of tuberculosis, both in the management of the disease, and, greatest of all, in its prevention. But whether we choose or not to work with and follow evolution in this selective process in tuberculosis, she will go right on just the same. In terms of lime starvation and assimilation certain things are conspiring to aid the work of the bacillus, and, fortunately, also certain things in our present civilization, most of all in food supply, are operating to check and offset it.

But we have strayed away from the matter in hand. This was the propriety of subjecting these ideas and possibly restraining some of these contrivances for the remedy or control of tuberculosis, with the verdict of rigorous experimental proof before bruiting them abroad. For tuberculosis is one of the few disease processes that can be more or less perfectly reproduced in the laboratory in animals. So if we pretend to control the phenomena of tuberculosis in human beings, it follows that we ought to predict and extend that control on experimentally tuberculous animals. But have the authors of these dozens of devices pretending to this control met with this test? They do not and they cannot.

And if they do not and cannot, it seems only fair and reasonable to be wary in our confidence, for something is wrong. Observe also the advantages of the experimentally tuberculous animals; how nicely the dosage of the bacilli may be measured and adjusted; how well variations in virulence may be introduced; and, finally, how companion animals may be put under precisely the same conditions to check up and counterpoise the remedial experiment. This wealth and amplitude of manageable variations in experimental tuberculosis far transcends our limitations in nature's experiments in human beings. The adaptability and inviting character of experimental conditions as a test for our understanding and reversal of the phenomena of tuberculosis hardly have a parallel in any other disease, and, indeed, in the whole realm of medicine.

But even to this day give a susceptible animal a virulent measure of

bacilli and use any of these exploited remedies, drugs, serums, tuberculins; do what you like, and you cannot stay the career of the disease nor deviate its course one hair's breadth. So if the truth were acknowledged, we do not actively control the sequence of events in tuberculosis, but rather this controls us. So a very simple and sensible test for the validity and reliability of any theory which pretends to the solution of the tuberculosis problem is to ask the authors to parallel their results for the hypothesis in experimental animals. And we should insist upon it. But so far this has not been done.

This very test, or even an excuse for it, is conspicuously absent in all those various measures which are supposed to apprehend the phenomena of tuberculosis in the abstract or work out in the concrete. The test is absent in Ferrier's treatment. Also in creasote administration. Likewise in the extraordinary claims of chinosol and formaldehyd intravenous injections.

And so on down the list. I have tried out the chinosol formaldehyd delusion and also the creasote proposition in tuberculous animals. This took nearly a year and was an utter failure. The results are not even worth publishing, although it would pad text. Life is too short to follow up all these rainbow hopes and measures based on half-baked guesses at the problem with the crucifixion of rigorous animal experiment.

So realizing that the badge and token of confidence of any supposed apprehension of the sequence of events in tuberculosis lay in the outcome of the animal test, and that the clinician should not be asked to take such measures on faith when so admirable a set of conditions as artificial tuberculosis are at hand in the laboratory, we planned out the experiment. What was to be undertaken, of course, was the production of artificial and manageable lime starvation in animals, and also the restitution of lime nutrition, so as to note the effects of these periods on the course of the infection by virulent tubercle bacilli properly controlled in perfectly normal companion animals. This was a hard gantlet for the generalization, for it meant success or failure, its life or death. But we confidently predicted the outcome and felt that it must work out, for a generalization of this magnitude cannot back and fill with inconsistencies, conforming in one breath with one set of phenomena, and in the next failing with a parallel set, and thus hedge about with excuses and contradictions. A true generalization must work universally and uniformly for all its own and kindred trains of phenomena. Under the guidance of a generalization investigation is not at random—of which there is much, hoping to hit upon a solution by prying effort, but

toward a definite and prescinded goal, alining new and untried data and exacting of them definite and even categorical answers.

The problem then was to make the bacillary infection give an account of itself when confronted with fluctuations in lime assimilation, and learn of its response and adaptations to withdrawals and returns of lime nutrition. This sounds simple, easy, but it is extremely tedious and difficult to carry out in actual practice. Dogs seem ideal for this experiment. Here is an animal in which lime may be abstracted from his natural diet and yet no interference imposed upon all the other elements of his normal food-supply. And then, of course, lime nutrition might be restored by simply letting go of the restrictions of the lime-freed diet and allowing the dog to go back to his bones, shift for himself, and fare as he chooses. I am very glad to acknowledge the impetus for this experiment to Russell's generalization, and am also fortunate for suggestions in carrying out the details of this régime of lime starvation in dogs, from the beautifully thorough and seemingly forgotten work of Voit,* published over thirty years ago. Voit produced rickets in dogs by protracted periods of lime starvation, although without any final calcium restoration, as in our experiments, and gives a most exhaustive gross description and analysis of osseous changes. The hen would also be a good subject for lime deprivation and restitution as governing or modifying the course of tuberculous infection, and such experiments are also under way.

Accordingly, on May 1, 1911, six puppies in two litters of three each were subjected to lime starvation, except one exempted as a control. These five puppies were locked up in cages and fed on selected, raw, chopped, lean beef, mixed up with pure "leaf" lard and distilled water. The control puppy was allowed to eat whatever he chose from the waste of the hospital kitchen—milk, oatmeal, soft bones, meat, and the like. From time to time the lard and meat were cooked to change its monotony. These young dogs had just been weaned, and were perhaps six weeks or two months old. At the end of seventy-five days it was surmised that lime starvation must have reached some considerable degree in the tissues at large, for the dogs had grown and thriven. And as growth and stature are largely due to increase, lengthening, and development of bone, the growing bones in these dogs must have seized upon and absorbed any residual store of lime in their tissues, since there was practically no intake of lime, though abundance of every other essential element of food. Lime forms 85 per cent. of bones.

* Voit, Edwin: Zeitschrift f. Biologie, vol. xvi, 1880, pp. 55–118.

So the experiment at this point seemed to fit the artificial conditions planned out; namely, with no interruption of tissue growth in all other respects, there has been contrived and carried out a dearth, a poverty, a using up of lime in the tissues and of its storehouse of supply for their use. In the mean time three puppies, two of one litter and one of another, died from some unknown cause, or most likely from negligence on the part of assistants in leaving unconsumed meat about in the cage until it became rotten. At any rate autopsy disclosed nothing but extreme redness and congestion of the intestines. There were then left at the end of seventy-five days three dogs, two lime-starved, and the control dog, which may be designated respectively A, B, and C.

At this point it is well to emphasize the fact that these dogs suffered no general starvation, but were deprived of lime and lime only. The criticism was offered that other complicating and unknown parts crept into the project, and left the truly remarkable effects of lime starvation on tuberculous infection open to the suspicion of some interloping or marplotting factor. But this it seems is not so. Indeed, the terms of the experiment are such that the elimination of these surreptitious factors is precisely what was designed and accomplished. The first duty of a purposive experiment is to cut out complicating issues and narrow down the interplay of such factors as we desire to control or get an answer from, and as are pointedly relevant to the matter in hand. If the absence of other interference than that of lime deprivation is not patent from the initial terms of the experiment, it becomes still more obvious at the close. For observe how the dogs grew and thrived!

At the beginning of the experiment they weighed three to three and one-half pounds. At the end of seventy-five days the two lime-starved dogs weighed seven and seven and one-half pounds, and the control animal five and one-half pounds. No just comparison in this contrast of weights can be had, because the control dog belonging to another family may have been naturally undersized or come from a smaller breed. But the contrast at least tends to show that the two heavier dogs were neither stinted nor stunted, starved nor impoverished nor weakened, except in one particular —the deprivation of lime. And, moreover, in spite of this, they grew up seemingly well nourished and sound. So if there are modifications, departures, or interruptions in the course of the ensuing tuberculous infection these are to be ascribed to lime deprivation and restoration and to this alone.

And what is more, if such modifications do occur, they are absolutely

in our hands and under our control, for we can give and take lime in these animals just as we please. If wrong about the isolation of this factor of lime nutrition in this experience, I hope to learn of it and be corrected; for this has the appearance of being a rather serious and responsible experiment. At any rate the fallacy, if such there be, is certainly not obtrusive, but extraordinarily well hidden. But to anticipate one line of criticism, which is fair, but not particularly profound, it may be suggested that lime deprivation may be accomplished in many ways other than in defective food supply. Thus protracted toxemias undoubtedly cause a waste of lime, and so also artificial and experimental toxemias might accomplish the same result. The suggestion was made that streptococcus infections in young dogs may bring about rickets. So if other means of producing lime waste faster than the intake of lime in food are inaugurated with the result of diminished resistance in tuberculous infection, it does not militate against our experiment. This criticism, made and welcomed by one of my colleagues, returns upon itself, and only strengthens and amplifies the generalization.

Our account of the experiment has almost as many interruptions as the experience itself. Thus nature herself stepped in right at the beginning to meddle with the experiment, and tried to guard the welfare of her creature with the most beautiful compensatory mechanism against our artificial emergency of lime starvation. And so, after a year went by, a lesson was learned which it must be admitted should have been taken into account at the beginning; namely, to have found out something about the response and tissue adaptations of our dogs to the lime starvation before rushing ahead with the inoculation of the bacilli and launching the infection. An account of these adaptations, however, is best given elsewhere, and it is time to see what happened to these animals now ready and prepared for their infection.

First, though, it is well to reflect upon the fact that this lime starvation is a silent transaction. The prologue to tuberculosis is as mute and insidious as is crying and demonstrative the later drama of infection. Hence the difficulty—the baffling character of scientific investigation of the one, and hence, also, the comparative ease of research of the other; and the Pelion on Ossa literature of its mere exciting cause, so inviting for mechanical and objective consideration.

I should like, for the provisional anchorage of attention on the matter, to divide the phenomena of tuberculosis into two parts or sets: the one, that great silent herald and forecaster of the later catastrophe might be called calcimalacia. The other set of events is what we call tuberculosis.

It needs no characterization. The laity has found a good name once it starts and gets headway. This second and later phase of the disease is the tubercle bacillus progression of events, which is but an episode in the disease, not the whole tragedy.

So little did lime starvation betray itself that you could not have told these dogs from any others. There was nothing noticeable about them, but in general they appeared a trifle weaker than their normal companion. And, although larger, when they played or quarreled with him they rather got the worst of it, stumbling and being unsteady on their feet. But still this in part may have been due to their closer confinement and fewer opportunities for exercise. It is quite likely, however, in any endurance test or a long run, the large-sized dogs would have fallen behind. As a matter of fact, these dogs had a certain degree of rickets, and an *x*-ray photograph exhibits, as I show you, the rachitic rosary of beaded ribs not present in the control and companion dog, although there are no other contrasts or deformities in the skeleton. One provision must be made here. I cannot say how faithfully my assistant carried out this lime starvation régime or how thoroughly and completely these dogs were starved of lime. I suspect that from time to time it was easier to interrupt the diet, without my knowledge, than to carry it out. Indeed, from subsequent experiments I suspect that the dogs were not completely starved, and that from time to time in one way and another managed to get the food they craved. If this is so, it speaks all the more strongly for the experiment, or, of course, it means that the degree of lime starvation was not gross, exaggerated, or extreme.

And now for the bacilli. These were of the virulent bovine type, and two weighed milligrams of them in two centimeters of salt solution were injected in the jugular vein of all three dogs on July 15, 1912, in precisely the same amounts and volumes and with the same rapidity of injection. The next part of the plan was to continue the lime starvation in one dog, restore it in the other, and watch the effects in their behavior side by side, counterbalance by the normal dog with his infection. So, after ten days, in order to give the bacilli (two milligrams are an inconceivable quantity in millions and billions) time to lodge and take hold, dog B was given back his natural food, while A was held down continuously to his privations in lime-free food. Thus B was given soup and other bones, milk, oatmeal, cooked meat, and, in general, the waste of the kitchen. B was put side by side with the normal control dog and the two fared alike, while their com-

panion in the lime deprivation hardship continued with the selected lean, raw, rump beef, lard, and distilled water.

In some forty days a great contrast began to be apparent. The continuously lime-starved dog began to fail. He became sick and weak, and he began to emaciate and lose weight—2½ pounds. In the succeeding four days all of these manifestations increased and grew worse, and finally, unable to stand up any length of time, he laid down on his side most of the time and was found dead forty-four days after the inoculation.

But while the continuously lime-starved dog was wasting away and dying of tuberculosis, his companion with restored lime nutrition was gaining weight, running and jumping about in the animal yards without the slightest embarrassment from the inoculation or any other trouble. And this was the case also with the normal dog. Indeed, at this time the remaining two dogs had nearly doubled their weights. Thus, on August 28, 1911, when the continuously lime-starved dog died forty-four days after the inoculation, his companion B had increased from 7 to 11¼ pounds, and the control dog from 5½ to 9¾ pounds. Two weeks later, on September 11th, or fifty-eight days after the inoculation, and forty-eight days after the return of this lime assimilation, dog B weighed 12 pounds and the normal dog, C, 10 pounds.

At this date, from experience with experimental canine tuberculosis, one could feel quite sure that these remaining two dogs had gotten the upper hand of the infection and would have lived out their natural span of life and died of other causes. But, curious to see what was happening in his tubercles, paralleling such a contrast to his wasted and dead companion, B was despatched on this date, and with him the normal dog, C, so as to compare the experiment with the behavior of the bacilli in a dog whose lime nutrition had never been disturbed in any way.

Now we are ready to look at the organs of these animals, as did Dr. Russell, Dr. Weist, his colleague, and Dr. Park, and then later, under the microscope, to contrast and compare the character and course of the reasons.

But first it may be well to be on guard against a misconception which still seems to arise occasionally, especially in the consideration of the lesions in miliary and experimental tuberculosis. And this is the estimation of the havoc of tubercles by wholesale attention to their quantity and distribution to the exclusion of their quality and course. In this way the healing and overcoming power of the body is not always appreciated. In the very worst case of tuberculosis there is always some degree of effort and expression toward healing—which should be a thing to work with and

a basis of hope. To many, however, a tubercle, especially in the small or even clustered miliary type, is only a tubercle in its most sinister sense, irrespective of its developmental stages, and those great critical qualitative changes which mark its career in progression or recession, in damage or healing. And in our first two dogs, with the antithesis of lime starvation and respiration, the point was made by some of our colleagues, in demonstrating to them the organs, that their appearances did not square off and tally with the contrasts of the life events. For in the matter of tubercles the successful dog appeared to be just as badly off as the defeated one.

And so, indeed, he was, if the number, size, and distribution of the tubercles were made the only and insistent point of distinction. In fact, for the moment it might be well to utilize this criticism, for it will serve to show that in the beginning of the infection no favor was shown in the distribution of the bacilli. And it shows especially also that ten days after the jugular inoculation of the two drams of bacilli at the turning-point of the lime restoration, the victor had no handicap over the vanquished dog in fewer lodging points of the bacilli or with fewer tubercles against which he had to contend. Thus, again, no underground or interloping factor in the caprices of bacillary distribution played any hand to tamper with the results. In that the two dogs stood on an equal footing in the bacillary factor of the equation; this, at least, seems, as the Germans say, "einwandsfrei"—"free from reproach."

So with a casual observation of the general tubercular infection it would have been hard to distinguish the fatal case from the recovering dog. Thus the lungs of the two dogs contain, say, in each lobe, several hundred, or, all told, some 3000, miliary tubercles. The livers were greatly enlarged, weighing in each case 580 grams, and were literally riddled with miliary tubercles. In fact, the livers were so involved with tubercles that collectively they were almost of the weight and volume of the organs themselves. You can picture the scene of the liver involvement by imagining a tubercle for nearly every other liver lobule and just about its size—a pin's head. Tubercles in the spleen in either dog were not visible.

With the exception of minor difference in the lymph-glands, there is nothing much further to relate in the distribution in the tubercles in these two dogs. As forecast in the *x*-ray photographs, there were no gross changes in the skull, vertebral column, or bones in general except the ribs. These, in both dogs, showed a string of pearly knobs at the junction of

the cartilage and the bone—the rachitic rosary. At first the skull-cap appeared thin and the ridges between the brain convolutions livid and finely roughened, like emery paper, but comparisons with various dogs of the same age make this observation dubious, and put it in that form of personal equation which blurs the observation of what actually occurred with the anticipation of what was expected. So, also, rather more changes in the ends of the long bones were expected than actually came to pass, and yet the foot of the femur and the head of the tibia in each dog appeared more fragile than usual. They split open easily. There was very little covering to the head of the bone, and the line of junction with the shaft exhibited the jagged, bluish-white zone described in rickets.

It is now in order to take up the critical part of the experiment in the contrast of the character and development of the tubercles. Herein the differences are truly striking, and they show best in the liver. Necrosis—cellular death—is the sinister sign in the tubercle; connective-tissue metamorphosis, the hopeful one. In the one it is the rule to find virulent bacilli ready to commence their depredations elsewhere, but in the other it is equally the rule to find the bacilli scarce or absent, and, such as there are, locked up and out of harm's way behind the guardian walls of connective tissue. Thus we speak of open and closed tubercles. And the turning-point, it seems, in the whole career of the tubercles and their possessor is this development of connective tissue. What is back of this great deciding factor of connective-tissue metamorphosis and what spurs its growth? This would appear to be a very vital and relevant issue in tuberculosis, which, unfortunately, tubercle bacillus research does not answer nor even consider. In the instance of our dogs this connective-tissue subjugation of the tubercles appears to go hand in hand with competent lime assimilation. It must be very difficult to settle problems without even formulating them.

However this may be, we were considering the hall-marks of the harmful advancing tubercle and the benign receding ones in the comparison of necrotic augmentation as against its decline with encircling connective-tissue development. In a tubercle of some size this distinction is obtrusive, for the signs of each are plain and patent. But in the miliary tubercles these signs are so miniature and belittled that in the livers of these dogs close scrutiny is desirable, lest the lessons of their differences be lost.

In the liver of the defeated dog the tiny pinhead tubercles project above the surface. They seem swollen and to be distended with some-

thing. In the victorious dog they are flush with the surface, and perhaps they even dip beneath, like little shallow pits or dimples. In the former case, too, the nodules are translucent. With an eight-fold magnifying glass one can see inside of them and into their contents. But in the contrasting liver the little islands are quite opaque and solid. And, moreover, delicate little embroideries and fine traceries of connective tissue run out from their corners and angles. With the hand-glass, especially in the tubercles of the first liver, the little clouds of Naples yellow, necrotic material occupy the centers and even fill up most of the nodules. But in the tubercles of the second liver there are no such peculiar yellow centers and curds. The most striking difference, perhaps, is the contrast in consistence. The liver tubercles in the fatal case are soft, like so many little bags or cysts, with pasty or only semisolid contents in the most fragile and delicate of walls.

Indeed, the walls seem so frail that they appear to be formed more by the surrounding liver tissue than by any intrinsic envelop of the envelop itself. In the surviving dog the little islands are dense, hard, and solid. Thus in attempting to crush out and smear these latter tubercles they acted like so many little seeds or bullets. Indeed, all that could be gotten on this slide in the smear were little wads of gristly material that could not be flattened out and were so tough that slides were broken at times in their attempted manipulation. This, by the way, is a good test and method to recognize the recovering form of tubercle in general, and especially where the eye fails to find them, as, for instance, in the spleen. And they may be easily told from the advancing soft and necrotic tubercle. In contrast to this, the hepatic tubercles of the vanquished dog smeared out with the greatest ease and gave a uniform film.

The two sets of smears show a remarkable antithesis as to the bacilli. While there are myriads in the one, none at all could be found in the other. Almost everywhere in the first smear chosen at random one can find great clusters of perfectly formed and intact bacilli. In the second smears, such few and scarce bacilli as there may be appear hidden in the lumps of connective tissue. In a similar and subsequent experiment these few hidden bacilli were disclosed by grinding up the tough tubercles in a mortar in emery dust and salt solution and examining the supernatant fluids. In general, also, the tubercles of the surviving dog of the lime-starved pair are somewhat shrunken and smaller than those of his companion.

In the lungs the differences of the tubercles were less striking. Indeed,

in each dog they appeared much the same: little, translucent, dull, opal-like, pinhead nodules. The differences in the lungs and spleen must be left for the microscopic examination. The full text of the microscopic examination may be given elsewhere.* We are concerned in this chapter more with the outline and meaning, what is strictly relevant in this microscopic study, rather than one of those scrupulous elaboration of details which recites them all indiscriminately, or with such little selection of the cogent or purposeful that one wonders what the problem was.

Indeed, the microscopic picture of the lives of the two dogs, with the continuous and interrupted lime assimilation, will have been anticipated. Microphotographs of sections of each, which, unfortunately, cannot be reproduced here, show the contrast at a glance. In the continuously lime-starved dog the tubercles are wide open and in full blast. These tubercles are naked, that is, they lie right against the liver cells, with no limiting membrane whatever; indeed, not the least attempt at one. They are full of cheesy liquid, or necrotic material, with a loose rim of small round cells.

But in the liver of the surviving dog there are spectacularly prominent walls of connective tissue and fibroblasts. Each has this little shell or capsule, and, had we allowed the dog to live, these surely would have become thicker and thicker, and would have advanced more and more to the center and have obliterated the tubercle. The cheesy centers also are shrunken and seem to be on their way to disappearance,—absorption,—however this occurs. To what is this wonderful metamorphosis due—nature's way of thwarting the tubercle? The answer seems to be, forty-eight days of lime assimilation. How did this operate? We do not know. To say that the lime intake "stimulated the fibroblasts" is only a catch phrase, which pretends to answer, but only asks the question.

The differences in lung and spleen are not so pronounced. The process of healing has been more tardy in these two organs. It must be remembered, too, that only forty-eight days had elapsed in the return of lime assimilation in the successful dog, and that the healing process in tuberculosis is from its nature slow, and goes on little by little and step by step. And yet, while the contrast is not so pronounced as in the two sets of

*Although under the title of the "Consumptive and his Frankenstein," other chapters in a popular little tract on Russell's generalization are: "Lime Starvation and Tuberculosis," "Rickets and Lime Nutrition," "Lime Starvation and Scurvy," "Maternity and Lime Assimilation," "Lime Starvation and Bovine Tuberculosis," "Our Reserve Storehouse of Lime," "The Pedigree of the Tubercle Bacillus," "De Profundis," "The Outlook."

livers, the tubercles in the victorious dog in its spleen and lung are more compact and denser than in his companion. In the former two there are fewer individually necrotic cells and a larger number of fibroblasts, although these are scattered about on the edge of the tubercle and not banded together in a zone or wall, as in the liver.

I think also that, had especial technic been undertaken for the study of fatty changes, more of these would have been found in the fatal case in these organs than in the case of recovery. In other words, the component cells of the tubercles in the case of interrupted lime starvation are less degenerated and are recovering from that degeneration more rapidly than in the case of continuous lime starvation experiment. Now, while this experiment seems to answer some question about lime starvation and tuberculosis, it presents a good many subsidiary ones, and we have only begun with this line of experimentation. For instance, what has become of all these vast numbers of tubercle bacilli which have disappeared in these forty-eight days of lime nutrition restoration? Other sets of dogs should be given this opportunity of doing away with the bacilli, and be observed, if possible, in the act. There is a good deal of literature informing us very minutely how the bacillus lives and grows on all sorts of cultures, and we are continually told of its versatile avenues of approach, but there appears to be no literature at all telling us how this bacillus dies in our tissues and how it disappears; which is of some consequence.

I do not wish to be positive as yet about this diminution of the bacilli until it is confirmed by a repetition of the experiment, but if we can judge by this single experience, it seems to be a fact. But these questions for the moment are secondary issues. The main cardinal point is—does this generalization stand a test of rigid experiment? It is still to be remembered that this is but a single and isolated experiment. But I feel all but certain that, given always the same terms, this experiment will come out uniformly, try it as often as you like. And if fifty repetitions of the experience are more convincing, it is at any one's disposal to accumulate such statistics.

There remains the contrast of the perfectly normal dog, inoculated with the same bacilli, on the same date, and killed on the same day as the restored lime assimilation dog fifty-eight days later. In general, to be brief, this dog had not the hundredth or even the thousandth part of the quantitative involvement of the other two dogs. The lungs were perhaps as badly involved numerically, but in the liver there was only a fringe of miliary tubercular involvement about an inch along the borders. This

dog's liver weighed only half as much as those in the other two animals. So, then, the lime starvation induced a worse involvement of tubercles quantitatively. Then, again, the tubercles in this dog were like those in B, healing, and especially in the liver encapsulating on their way to connective-tissue obliteration. As in B, also, the bacilli were absent or exceedingly difficult to find. What happened then in this experiment was that the natural resistance and refractoriness of dogs to tuberculosis were taken away and returned just as we chose in the deprivation or restitution of lime assimilation. This is tantamount to saying that we have the control of tuberculosis from the experimental standpoint, at least, right in our hands and under our control, and we are warranted, I think, in looking forward to exercising some similar and comparable control in human beings, provided they have not gone so far on in the disease that to get well would be a miracle. It is customary and useful to sum up at the close of an article and present conclusions. But they seem obvious and perhaps are worth attention without especial encomiums and reinforcements.

DISCUSSION ON PAPER BY DR. VAN GIESON

Dr. William H. Park, New York: I have been struck with the fact, as pointed out by Dr. Van Gieson, that these dogs acted as we have seen, and, as he has said, it is certainly a point of importance. It must be remembered that the deprivation of lime was greater than could occur under any ordinary conditions.

Dr. Alfred Meyer, New York: It occurred to me some years ago that we might possibly make some headway in the therapy of pulmonary tuberculosis by having chemists the world over make some modern analyses of healed lesions. This would be work that could be done in some of the great hospitals of the world, and would mean simply the gathering of a large amount of calcareous material from the apices in cases of people who have died of other diseases, and making a fresh start. That would mean improved chemical methods in getting exact chemical statements as to the composition, especially of the calcareous deposits of healed lesions in the lung. This may not be exactly a point bearing upon the paper by Dr. Van Gieson, but it is a subject closely allied to it, and this work might prove additional and corroborative, and ultimately there might be a new and valuable point of departure. I take this opportunity of offering this suggestion to those who can get material of this kind and give it to a reliable chemist to apply modern methods of analysis.

Dr. Lawrason Brown, Saranac Lake: Some years ago, you remember, Richet advocated zomotherapy in the treatment of tuberculosis, a treatment which consisted largely in the administration of raw meat and its juices. At that time I took a number of dogs and gave them intravenous injections of tubercle bacilli, and fed some entirely upon raw meat; others we kept on a general diet. As I recall the experiments now, I think we gave some bones with the meat and took no special pains to keep the diet free from lime. The dogs were given ordinary water, but nothing but raw meat as food. All the dogs fed on raw meat died from tuberculosis very quickly, whereas the dogs who received a general diet lived much longer. It is possible that other factors besides the lime are concerned. I was much interested in the two experiments of Dr. Van Gieson.

I think we ought to be careful about saying that 90 per cent. of the cases of tuberculosis are cured. I called attention yesterday to the fact that I did not believe 90 per cent. of the cases which came to diagnosis were cured. I do not think tuberculosis, when once diagnosed, is the most curable of all diseases, and we will create a false impression if we say that 90 per cent. of the cases diagnosed as tuberculosis are curable. If that is true, some of us are getting very poor results.

THE RELATION OF ANIMAL FAT TO TUBERCLE BACILLUS FAT

(A Suggested Explanation of the Apical Lesions in Man and Caudal Lobe Lesions in Cattle)*

By William Charles White, M.D., and A. Marion Gammon
Pittsburgh

The relation between the fat stored in the animal body and the fat in the tubercle bacillus growing in this animal body seems at first glance a very indefinite one; and yet an attempt to establish such a relation yields many points of interest, the correlation of which establishes a connection between the two which is apparently very close.

The storage of fat in bodies that are the seat of tuberculous infection is usually the basis of a favorable prognosis. While this is accompanied by a recession of other symptoms of tuberculosis, such as fever, tiredness, sputum, and lung signs, still it is the storage of fat which is the striking feature of improvement both to patient and physician. This storage of fat, too, is the main object of the tripod of rest, fresh air, and feeding, which forms the foundation of our treatment in this disease.

On the other hand, in bodies which are the seat of a tuberculous infection which is gaining the upper hand, no feature is more striking than the rapid consumption of the fat which was previously stored in the fat reservoirs of the body. This consumption of fat is in most cases greater in amount than the accompanying fever would explain.

One of the problems connected with this relation of fat to tuberculous infection is associated with the varied composition of the fat occurring in different animals in which the disease occurs. For example, the fat of humans after infancy is largely[1] composed of the glycerids of palmitic and oleic acids. The fat of infants,[2] on the other hand, has a larger percentage of the glycerids of stearic acid, and in this way more closely approximates the fat of cattle, which has a larger percentage of the glycerids of stearic

* From the R. B. Mellon Laboratory of the Tuberculosis League of Pittsburgh.

acid.[3] The fat of fishes has a larger percentage of the glycerids of oleic acid.[4]

It occurred to us that this wide variation in the composition of the fats of different animals may in some way be closely connected with the variation in the different types of tubercle bacillus, and that, as an instance of this, the stearic acid content of infants' fat, approximating as it does cattle fat, may contain the nucleus of the greater susceptibility of infants to the bovine bacillus.

This conception seems more likely to contain some truth from the various studies which have been carried out on the fat content of the various types of tubercle bacillus. The tubercle bacillus has a very large content of fatty substance; this fat content varies in character and amount under varying conditions of growth and origin. Ruppel[5] found the fat content varied with age of culture from 8 to 26 per cent. De Schweinitz and Dorset[6] found that the total extracts from the tubercle bacillus of different origins, using three extractives, ether, alcohol, and chloroform, were as follows:

Bovine bacilli	26.32%	Avian bacilli	30.65%
Swine "	20.59%	Attenuated human bacilli	37.41%
Horse "	31.76%	Virulent " "	28.03%

In this analysis the most striking fact—and this we will refer to later—is the high percentage of fat extracted from the attenuated human organism. Aronson[7] found that with a low percentage of glycerin the wax content of the tubercle bacillus grown on media was much reduced. These studies seem to be in some way associated with the different behavior of the human and bovine bacillus grown on glycerin broth which Theobald Smith[8] has pointed out. It is possible that the use of glycerin by the tubercle bacillus is associated with its relation to fat, since the glycerin forms so large a factor in fat composition. This is no new observation, and is mentioned here only to point out, in connection with the present work, that the close resemblance which Smith found to exist between the bovine and avian bacillus may be associated in their origin from grain-eating animals whose fat content is largely composed of the glycerids of stearic acid.

We proposed, a year ago, to attempt to work out some of the problems connected with the relation of the fats of the tubercle bacillus to body fat, both from a biological and cultural standpoint. In the present paper we will confine ourselves to certain cultural characteristics which we have found, and to the bearing of these on certain anatomical conditions found in man and cattle especially relating to the point of maximum attack in pulmonary tuberculosis of these two animals. Our work on the influence on tubercu-

lous infection of various types of fats stored in the lungs before and during period of infection, and on the influence of the components of these fats, such as glycerin and various fatty acids, in the same connection, we will report in later papers.

In choosing the various fats for this work, many difficulties were encountered. It was desired, in the first place, to secure fats which were fluid enough to mix with culture-media and yet which contained as high a percentage as possible of a single one of the five radicles with which we wish to deal (as the basis of most body fats), viz., stearic acid, oleic acid, palmitic acid, and linolic and linoleic acids. With this object in view we used olive oil for the oleic acid, palm oil for the palmitic acid, linseed oil for linolic and linoleic acids, and beef-suet for the stearic acid. The latter was difficult to handle on account of its high melting-point. We also used more complex fats, such as butter and human fat. Our work is open to serious objections of which we are aware, but, as with all new fields of work, we had to start with that knowledge which was available and in later papers we will have corrected some, at least, of these difficulties.

It was found that in the test-tube certain fats had a decided influence in determining the rapidity of growth of the tubercle bacillus as well as its staining properties and virulence. To 5 per cent. of glycerin-agar tubes were added 6 per cent. and 20 per cent. of the following fats: human fat, olive oil, butter, linseed oil, beef-suet, paraffin, and palm oil. The human and beef fat were obtained at autopsy and rendered in the laboratory over a water-bath. The tubes were then sterilized and after sterilization cooled; then when near the solidifying point, vigorously shaken, rapidly cooled on ice, and slanted; in this way a uniform distribution of the fat in the glycerin-agar was obtained. Five tubes of each fat glycerin-agar and five tubes of glycerin-agar as control were then inoculated with tubercle bacillus of human and a similar series with tubercle bacillus of bovine origin transferred from egg media. The tubercle bacilli used in these experiments were from strain H37 and B1 Saranac Lake, kindly furnished us by Dr. E. R. Baldwin.

The human bacillus grew best on the human-fat agar and butter agar tubes. The growth on the olive-oil agar tubes was not so abundant as on the control glycerin-agar tubes and the growth on the linseed-oil-agar tubes was very slight.

The bovine bacillus did not grow so abundantly as the human strain, but the growth on the human-fat, olive-oil, and butter tubes was much in advance of the control glycerin-agar tubes. The growth on the linseed-oil tubes was scarcely noticeable at the end of six weeks.

The beef fat in tubes did not stimulate the growth of either organism, although both grew slightly and were cultivated again on egg media after two months.

The palm-oil tubes were not successful on account of the difficulty in securing uniform distribution of the fat in the agar. Both human and bovine organisms grew on the agar between the fat-containing areas of the slant, but not on the palm oil.

On paraffin the organism grew after eight to ten weeks with a dry, brownish appearance in the growth.

The difference between the growth of the human tubercle bacillus on the five tubes of human-fat glycerin-agar and the growth on the five tubes of plain glycerin-agar was very striking and was the same on all tubes, being 100 times more abundant on the former tubes. The growth on the fat-containing tubes presented a peculiar oily appearance to the eye.

Smears were made after six weeks from the various tubes, stained in carbolfuchsin, and the time of decolorization determined by immersing for various times in 4 per cent. nitric acid in equal parts of acetone and alcohol. It was found that at the end of six minutes the organisms from the plain glycerin-agar tubes were almost completely decolorized, while after ten minutes the organisms grown on human-fat, olive-oil, and butter agar still retained their stain very evenly and well.

This we hope to show has some bearing on the fact, noted by de Schweinitz and Dorset, that the fat content of the avirulent human type which they studied had a far greater fat content than the virulent form. The increased acid-fast character of those organisms grown on fat noted in our own work suggests a decrease in the virulence of the organism, but this aspect of the work must be carried much further before such a conception can be accepted.

After repeating these series of experiments a number of times and finding that the influence of fats of various sorts in the culture-media had a constant and definite influence in increasing the rapidity and character of the growth of the tubercle bacillus in the test-tube, we took the same fats and submitted them, for various periods of time, to the action of liver extract prepared after the method described by Kastle.[10] We then took these mixtures of fat and liver extract and, after sterilizing, mixed them in various proportions with 5 per cent. glycerin-agar prepared as in the former unaltered fat experiments, and again inoculated five tubes of each mixture and five tubes of plain glycerin-agar (used as control) with as nearly uniform quantities as possible of human and bovine tubercle bacillus.

The results of these experiments were in some instances more striking than the pure fat experiments. The growth of the human tubercle bacillus

on each liver-altered human-fat agar tube was four or five hundred times more luxuriant than on the plain glycerin-agar. The growth on all the liver-altered olive-oil and liver-altered linseed-oil tubes was also more abundant than on the plain glycerin-agar tubes.

The growth of the bovine bacillus was much more abundant on the liver-altered olive-oil and linseed-oil agar tubes than on the plain glycerin-agar tubes, but on all three of these groups less than on the liver-altered human-fat agar tubes.

The other fats were not included in this experiment, which has been repeated with the fats named above.

Explanation of Apical Lesions in Man and Caudal Lesions in Cattle

The results of the use of these various fats and split products of these fats on the growth of the tubercle bacillus have suggested an explanation of—

1. The apical lesions which are so common in pulmonary tuberculous infections in man.

2. The caudal lobe lesions which form the characteristic expression of pulmonic tuberculous disease in cattle.

Having determined that the tubercle bacillus is able to use various fats and their split products to its own advantage when grown on artificial media, it seemed possible to correlate this fact with the work of J. B. Leathes[9] on the function of the liver in mobilizing and changing the fats already stored in the subcutaneous tissues in explaining why the favorite site of growth of the tubercle bacillus in man is the highest point in the lung. Leathes was able to show that the fats stored in the reservoirs of the animal were mobilized in the liver and here prepared for utilization by the other organs of the body which during their action burned the fat. This liver-altered fat is of necessity poured into the inferior vena cava and thence finds its way into the pulmonary artery and from here passes directly into the lung capillary system. If one studies the anatomy of the pulmonary artery, however, one sees that before dividing into the right and left pulmonary branches it forms a great bay of blood bounded by a very elastic vessel wall. The blood in this portion of the pulmonary artery must move with comparative slowness, because of the short circuit which it makes in comparison with the long circuit made by the general aortic quota of blood. In this great bay the blood is loaded with fatty derivatives of low specific gravity compared with the whole blood. Owing to the slowness of the current due to the elasticity of the vessel and the short circuit to be traveled, these compounds have a chance to rise to the surface of the stream, so that the upper layer of blood in the pulmonary artery should have a much larger content of fatty

compounds than the lower one. If one now follows the pulmonary blood-stream in man, it is readily seen that at the highest point of this main stream the vessel arises that supplies the apex of the upper lobe on either side. If the theory advanced be correct, this vessel, owing to the upright position in man, should be the vessel most laden with the fatty compounds of low specific gravity which are being poured into the pulmonary stream by the liver mechanism, because these compounds, of necessity, rise rapidly to the highest level of the fluid bed in which they are traveling. This view, coupled with the results of our experimental work so far completed, which shows that the tubercle bacillus makes use of these compounds for its more abundant growth, seems a most reasonable explanation of its more prevalent development in the apex of the upper lobe. In other words, it is in the lung that the tubercle bacillus gets first pick, so to speak, of the fatty compounds which it needs for its development and receives the greatest supply of these at the apex of the upper lobe in animals that maintain an upright position.

Our next step was to determine on this basis where the highest point in the pulmonary blood-stream of bovines lay, and by plaster injections we were able to determine that the same law as we have outlined for man, if applied to bovines, would carry the fatty compounds of low specific gravity to the apex of the caudal lobe. Having decided that this was true, we were sure that if the law held good we should find in this region the point of maximum attack of pulmonary tuberculosis in bovines. Not having the literature at hand to add the clinical proof to our theoretical conclusion, we wrote to Dr. Schroeder in Washington without mentioning what the trend of our work was and received the following letter in answer:

"The lungs of cattle have seven lobes, as follows: two anterior; two median, somewhat larger than the anterior; two caudals, much larger than the median; and an azygos, which is attached to the right anterior.

"The commonest location of tuberculous lesions in bovine lungs is in the posterior dorsal portions of the large caudal lobes from the apices forward and upward. This region is dorsal to the main bronchus and rests under the ribs at or near their junction with the vertebræ.

"The only similarity I can trace between the seats of tuberculosis in human and bovine lungs, taking respective natural positions of human and bovine bodies into consideration, is that in both these species those portions of the lungs are more commonly affected which have the highest location."

It will be seen that the clinical data bear out fully our theoretical conclusion. We hope to be able, in the near future, to demonstrate that certain

points concerning the pulmonary stream which we have concluded should occur from a theoretical physical basis, occur in fact. If we are able to do this, we feel convinced that this offers the most reasonable explanation on a pure chemical and physical basis of the elective points of pulmonary tuberculous infection in man and bovines.

We were able, during the progress of this work, to go over it with Professor J. B. Leathes, of Toronto, who suggested that it would be wise to get rid of the extraneous substances contained in the liver extract by splitting off the fatty acids with sodium hydrate, then separating these with an excess of acid and, after washing, use these substances in the culture tube. In this way the experiment would deal with simpler and purer compounds. This work is at present in progress and will be reported later.

M. P. Ravenel[11] also suggested that during some former work of his own he had noticed that the tubercle bacillus would grow on paraffin. This we have confirmed in our own work, but what use the tubercle bacillus makes of so foreign a fat as paraffin we are at a loss to understand.

The various aspects of the relation of fat added in abundance to the medium on which the tubercle bacillus is grown, to the virulence of infection in the body, we can at present barely touch upon. If fat and its split products make the tubercle bacillus grow, why, for instance, does increase of body fat indicate improvement? Some of our experiments suggest that bacilli overfed with fat in the test-tube become less virulent. For example:

1 milligram of tubercle bacilli grown on 5 per cent. glycerin-agar and human fat,

1 milligram of tubercle bacilli grown on 5 per cent. glycerin-agar and butter,

1 milligram of tubercle bacilli grown on 5 per cent. glycerin-agar and olive oil—

were injected into rabbits. The weights and first autopsies suggest, as stated, a diminished virulence in the fat-gorged organisms, but it is far too early to draw even tentative conclusions.

The above results further suggest an explanation of the susceptibility of certain diabetics to tuberculosis, since "the occurrence of very large quantities of fat in the blood plasma seems to be a phenomenon peculiar to diabetes."

We were not able to determine, what we started out to prove, that such methods as we have employed offer a means of distinguishing the human and bovine types of organism; but the findings still suggest the possibility that in the relation of animal fat to tubercle bacilli there may be found some light on this question.

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DISCUSSION ON PAPER BY DR. WHITE

Dr. Alfred Meyer, New York: I would like to ask what proof or evidence has been given postmortem with reference to the activity of the circulation and so-called reservoir, or what confirmation of that postmortem condition of the circulation has been found during life, and whether it would not be possible, inasmuch as we are lacking in scientific evidence, to make some investigations along that line to prove that point of view. The whole thing is to a considerable extent in the experimental and theoretical stage. I would not be quite ready to accept the mechanical structure on which the theory is built in its entirety unless we had some corroborative evidence, besides the lighter specific gravity, for the bacillus-laden fat to rise to the top and increase the probability of apical infection in the human being and a corresponding infection in cattle.

Dr. White: It is true that a fat-laden bacillus of low specific gravity may rise more easily to the apex of the lung; but, in addition to this, the top of the lung is laden with other fats as well, and because the tubercle bacillus grows more readily in the presence of fat than it does without fat I have suggested the present theories. Both of the above statements, however, may have direct influence on this choice of location. Physiologists' answer to the suggestion I have made is that they cannot prove it wrong. The trouble in experimentation is that it is difficult to keep animals long enough in an upright position to determine what I have suggested, and we have been unable to devise experiments up to the present time which will help us out on the physiological side.

THE VARIATION IN THE LONGEVITY OF TUBERCLE BACILLI FROM DIFFERENT INDIVIDUALS*

By B. L. Arms, M.D., and E. Marion Wade, B.A.
Boston

At the meeting of the American Public Health Association, held in Winnipeg in 1908, a preliminary paper was presented† by the staff of this laboratory concerning some tests relative to the longevity of tubercle bacilli in sputum when exposed to the action of the air.

Other work has prevented the completion of this study, but we were asked to give a report of progress at this time.

Not until 1911 did we have an opportunity to repeat any of the tests, and then we tried not only to test the longevity of the organisms, but also to determine the variation in viability of organisms from different individuals, and to find if there was any relation between the longevity of the organism and the clinical condition of the patient.

The sputa used in the first two tests herein reported were obtained from the House of the Good Samaritan, and the last from the Boston Consumptives' Hospital.

In order to have identical conditions we exposed sputa from several sources at the same time, and thus we have three tables, one of six exposed March 10, 1911, one of five exposed July 1, 1911, and one of eight exposed the middle of January, 1912. The results have shown the great variation in the length of time during which the organisms retain their ability to produce lesions in guinea-pigs. The technic followed in the previous tests was observed, save that only the pieces of throat sticks were used, omitting the carpet.

All sputa were thoroughly shaken and the number of organisms recorded by the Gaffky scale. While we would prefer to have sputa containing an

* From the Bacteriological Laboratory of the Boston Board of Health.

† "Am. Jour. Public Hygiene," vol. v, No. 3, 1909, p. 586.

TABLE I

LENGTH OF EXPOSURE IN WEEKS

SPUTUM	GAFFKY SCALE	CONTROL	1	2	3	4	4½	5	5½	6	6½	7	7½	8	8½	9	9½	10	10½	11	11½	12	12½	13	13½	14	14½	15	15½
1	6	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	—	—	—	—	—	—	—	—	—	—	—	—	—
2	7	+	+	+	+	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	..	..	..	*dd*	*dd*	*dd*	..	..
3	7	+	+	+	+	+	+	+	+	U	+	+	+	—	+	+	+	—	U	—	U	—	—	—	—	—	—	—	—
4	4	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	—	+	U	—	U	—	—	—	—	—	—	—	—
5	4	+	+	+	+	+	+	+	+	—	+	+	+	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6	8	U	+	+	+	+	+	+	+	+	+	+	+	+	+	U	+	—	—	U	—	—	—	—	—	—	—	—	—

Sputum from House of Good Samaritan, 3-10-11.
+ = positive.
U = Unsatisfactory, *i. e.*, pig died too soon after inoculation for lesions to develop.
— = negative.
dd = Double dose.

equal number of organisms, it is, of course, out of the question, and the results do not seem to depend altogether on the number present.

The limit of infectivity of these sputa ranged from four to ten weeks. It is interesting to note that one of the two sputa containing the smallest number of organisms gave the last positive, ten weeks, and this was from a case in which the patient was improving; while sputum No. 2, containing many times the number of tubercle bacilli and from an advancing case, furnished no positive after four weeks.

These specimens were exposed in a small closet through which air could circulate, and this was stored in the room where our formaldehyd generators were kept, so there is a bare possibility that there may have been some slight action on the viability of the bacilli.

During the fourteen months that have elapsed since these tests were made the first two patients have died; no improvement has been manifest in Nos. 3 and 5, 4 has improved, and no subsequent history could be obtained on No. 6.

Our next test consisted of sputa from five patients, two of whom were advancing cases, one improving, one stationary, and from the other no history was obtained at the time, as she was a new patient. Having found in the previous test that all the sputa caused lesions after four weeks' exposure, we did not begin the inoculations until four weeks had elapsed, and to our surprise we found that not a single positive developed.

The exposure of these sputa was made in the same receptacle as previously, but it was moved into our office that there might be no possible action from the formaldehyd.

TABLE II

Length of Exposure in Weeks

Sputum	Gaffky Scale	Control	4 Weeks	5 Weeks	6 Weeks	7 Weeks	8 Weeks
1	7	+	—	—	—	—	—
2	3	+	—	—	—	—	—
3	4	+	—	U	—	—	—
4	5	+	—	—	—	—	—
5	8	+	—	—	—	—	—

Since these exposures were made patients 1, 2, and 5 have died and there has been no improvement in Nos. 3 and 4.

It happens that our continued positives have been obtained during the cold months, and those tests started during the summer have given very short infection periods; in fact, so short that they have been missed, but hereafter inoculations will be made from the time of exposure. We will try to repeat during the coming summer. The third test has not been continued a sufficient length of time to give end results, but these are presented to the end of the twelfth week. Nos. 7 and 8 in the following table were exposed a week after the first six, but as the results are expressed in elapsed time, this has no bearing on the outcome.

TABLE III

LENGTH OF EXPOSURE IN WEEKS

SPUTUM	GAFFKY SCALE	CONTROL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18*
1	8	+	+	U	+	+	+	+	+	+	+	+	+	+	+	+	—	—	—	—
2	3	+	+	+	U	+	—	+	+	+	+	+	+	+	—	—	—	—	—	—
3	7	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	—	—
4	8	+	+	+	+	+	+	+	+	+	U	+	+	+	+	+	+	+	+	—
5	7	+	+	U	+	+	+	+	+	U	+	+	+	+	+	+	+	—	—	+
6	1.5	+	+	—	+	+	—	—	—	—	—	—	—	—	+	o	—	—	—	—
7	5	+	+	+	+	+	—	—	+	+	+	—	+	—	o	—	—	—	—	..
8	7	+	+	+	+	+	+	+	+	+	+	+	—	—	+	—	—	—	—	..

In the above table, Nos. 1, 2, 4, 7, and 8 were advanced cases, while 3, 5, and 6 were not in as bad physical condition.

Since we obtained the sputa in January the five advanced cases have died, No. 3 was discharged February 24th, condition unimproved, No. 6 was discharged March 20th, condition improved, and No. 5 is still at the hospital condition about stationary.

In the next series we will get sputum from No. 5 if he is still at the hospital, and if possible we will get some from No. 3 and No. 6.

We realize only too well that our material was not sufficient, and the only excuse we have to offer for the presentation at this time is that we were requested to do so.

Work of this kind is of necessity very slow, as it requires weeks after the death of the organism before we can discontinue the inoculations, for it is

* Results in the table have been included up to the time of reading proof, July 9th.

impossible to determine the termination of viability until more than one negative has been obtained, and this means at least eight weeks, during which inoculations are made after the last positive is secured.

We are in the present test using more than one piece of throat stick after fourteen weeks and in the next will begin earlier, as, of course, what it is desired to demonstrate is how long may sputum convey infection, not how long is a certain indefinite amount capable of producing lesions.

To Drs. C. F. Whitney and J. J. Scannell, of our staff, who have assisted in the work; Miss Coleman, of the House of the Good Samaritan; and Dr. J. E. Overlander, of the Boston Consumptives' Hospital, who have furnished the sputa, we extend our appreciation for their coöperation.

DISCUSSION ON PAPER BY DR. ARMS AND MISS WADE

Dr. Edward R. Baldwin, Saranac Lake: I should like to ask how the sputum was prepared—whether it was in a moist condition, or whether it was dried or allowed to ferment, with fluid added to it, and what its condition was when exposed.

Dr. Arms: That was not given in this paper, but it was in the other. The sputum was obtained in a fresh condition and thoroughly shaken to secure uniform distribution of the organisms, if possible. Then we poured, on a piece of tongue depressor an inch and a quarter long, as much as would stay on, and allowed it to dry in the air. These were put in a receptacle where there would be a passage of air at the same time; they were in the dark, and the pieces were moistened in sterile water at the various periods of exposure, and inoculations made subcutaneously in guinea-pigs.

THE RELATION OF THE VIRULENCE OF THE TUBERCLE BACILLUS TO ITS PERSISTENCE IN THE CIRCULATION*

By Alfred F. Hess, M.D.
New York

Bacteria frequently gain access to the circulation. However, there is still a marked difference of opinion as to how frequently this occurs and how serious this invasion is, some believing that it is a phenomenon always accompanied by marked systemic disturbance; others, that if the number of bacteria is small, the body rids itself of the invaders without the aid of any general reaction. It is known that microörganisms are eliminated from the circulation chiefly by way of the kidneys and of the liver, but it is not known what the determining factors are. Are the bacteria filtered from the blood-stream by means of the tissues, in the same way as inert foreign particles, for example, as would be the case if an equal amount of egg-white had found its way into the blood, or does this mechanical process play a rôle secondary to other finer defensive processes?

The following investigation was undertaken primarily to obtain some answer to a simple question, to discover whether, quite independent of their power of multiplication, a direct relationship exists between the virulence of bacteria and their ability to maintain an existence in the circulation. It seemed as if the tubercle bacillus presented an unusual opportunity for a study of this nature. For, as is well known, the bovine type of tubercle bacillus is highly virulent for rabbits when a small fraction of a milligram is injected intravenously, whereas the human type of this bacillus is but slightly virulent, possessing the power of giving rise to merely local lesions in the lungs and in the kidneys, which do not disseminate the disease or result in the death of the animal. The two types of bacilli are almost alike morphologically, and multiply so slowly as to make this factor negligible in an experiment of short duration. Their chief and preëminent difference

* From the Research Laboratory, Department of Health, New York City. Presented in part before the Society for Exper. Biolog. and Med., April 17, 1912.

is that of virulence. A series of tests was therefore instituted, which, briefly stated, consisted in inoculating a measured quantity of human and of bovine tubercle bacilli into the circulation of rabbits, and of determining whether they persisted in the blood-stream for approximately the same length of time.

TABLE I.—RELATION OF VIRULENCE OF TUBERCLE BACILLI TO THEIR PERSISTENCE IN THE CIRCULATION OF THE RABBIT

Intervals in Hours Between Inoculation and Bleedings of Rabbits		Amounts and Type of Culture Inoculated				Remarks
		Bovine $\frac{1}{100}$ mg.	Bovine 1 mg.	Human $\frac{1}{100}$ mg.	Human 1 mg.	
Experiment I	½	—	Tb.	—	—	
	1	—	Tb.	Tb.	—	
	2	o	Tb.	—	—	
	3	Tb.	—	—	—	
Experiment II	½	—	—	—	Tb.	This bovine culture was almost avirulent for rabbits.
	1	—	—	—	—	
	2	—	—	—	o	
	3	—	—	—	—	
Experiment III	½	o	—	—	—	
	1	Tb.	o	—	—	
	2	Tb.	—	—	—	
	3	Tb.	—	—	Tb.	
Experiment IV	½	Tb.	Tb.	—	o	
	1	Tb.	Tb.	—	o	
	2	Tb.	Tb.	—	o	
	3	—	Tb.	—	—	
Experiment V	½	Tb.	Tb.	—	—	
	1	Tb.	Tb.	—	—	
	2	Tb.	—	—	—	
	3	—	Tb.	—	—	
Experiment VI	½	o	Tb.	—	—	
	1	Tb.	Tb.	—	—	
	2	—	Tb.	Tb.	—	
	3	Tb.	Tb.	—	—	

Tb. = tuberculosis. — = no tuberculosis. o = not considered.

The experiments were planned as follows: Four rabbits were injected for each test—two with a human type of bacillus, the other two with the bovine type; in each case $\frac{1}{100}$ mg. and 1 mg. of a culture was suspended in salt solution and injected into the ear vein. These four animals, which were of about equal weight, were bled at regular intervals, generally one-half hour, one hour, two hours, and three hours after inoculation, 5 c.c. of

blood being caught in a solution of sodium citrate. Thus there were eight specimens taken from the two rabbits inoculated with the human tubercle bacillus, and eight from the two inoculated with the bovine bacillus. These sixteen specimens of blood were immediately injected subcutaneously into as many guinea-pigs, and after six weeks these animals were examined for tuberculosis. In addition to a series of experiments of this description others were undertaken in which the rabbits were bled soon after inoculation, or after a period longer than three hours following the injection of the bacteria. Furthermore, it was possible to test the blood of a large number of rabbits which, in the course of various laboratory work, had been inoculated with bovine or human tubercle bacilli, and to study, in this connection, the relation of bacteremia to the tuberculous condition of the animal—a subject which in the field of human pathology has been the center of much discussion during the past few years, and which we touched upon only incidentally.

It will be seen, from the accompanying table (Table I), that six experiments, of the type which has been outlined, were successfully carried out. Others were undertaken, but, owing to difficulty in bleeding the rabbits, to occasional clotting of the blood, to the premature death of some of the guinea-pigs, or to other unavoidable causes, they had to be altogether rejected.

TABLE II.—SUMMARY OF SIX EXPERIMENTS IN TABLE I

Number of Experiment	Bovine +	Bovine −	Human +	Human −
1	4	3	1	7
2	0	8	1	6
3	3	3	1	7
4	7	1	0	5
5	6	2	0	8
6	6	1	1	7
Total	26	18	4	40
Combined Total	44		44	
Tb., per cent.	59%		9%	

The table shows our results more clearly than mere description. If we take the first experiment, for example, we find that of the eight pigs inoculated with the blood of rabbits injected with bovine tubercle bacilli, four

showed tuberculosis when killed after an interval of six weeks; one died prematurely, so that three of the eight tests were negative. On the other hand, only one specimen of the eight taken from the two rabbits inoculated with the human culture incited tuberculosis in the guinea-pigs used for the tests. In this way the experiments may be interpreted. Table II brings out these results more clearly, and is a summary of all six experiments. Here we see that there were 44 rabbits inoculated with a culture of human tubercle bacilli, and an equal number of successful inoculations with bovine culture. This includes all specimens of blood drawn at intervals varying from one-half to three or four hours after the rabbits were inoculated. Of the bovine tests, 26 were found to contain tubercle bacilli,—that is, 59 per cent.,—whereas of the tests with human culture, only four gave rise to tuberculosis in the guinea-pigs, that is, only a little over 9 per cent. It will be seen that there is some irregularity in the results; that at times bacilli were found in the circulation after two or three hours, although they were not demonstrable after shorter intervals. The difference between the two groups as shown in this table is, however, so marked that the conclusion is definite that the two types of bacilli, the markedly virulent and the feebly virulent, differ decidedly in their ability to persist in the circulating blood. That this difference is intimately associated with virulence was further brought out by an experiment in which a bovine culture was used, which was almost avirulent for rabbits as the result of prolonged artificial cultivation (Table I, Exp. II). In this experiment the bovine bacilli were not found in the circulating blood in any instance. Furthermore, it must not be thought that the negative results of the various tests with the human culture were attributable to its having lost its virulence for guinea-pigs, for a series of tests using from 1/1000 mg. to 1/1,000,000,000 mg. of culture proved that 1/100,000 mg. incited a marked tuberculosis when injected subcutaneously.

Table III is a record of bleedings of a rabbit made at various intervals for more than twenty-four hours after it was inoculated with 1 mg. of a virulent bovine culture. It will be seen that these bacilli were still circulating in the blood twenty-seven hours after inoculation. In tests instituted one week to two months after inoculation with a bovine culture, tubercle bacilli were found in six out of seventeen instances, and all six had been injected from one to two months previously, so that it would seem that there exists a period in which the blood is sterile, an intermediate period between the time when the bacilli originally inoculated are eradicated from the blood-stream, and when, in the course of a progressive tuberculosis,

bacilli once more gain access to the general circulation. Among 23 similar tests in which a human culture of tubercle bacilli was inoculated, producing, however, but slight or no tuberculous lesions, only two showed bacilli in the blood. In one of these positive cases a careful postmortem examination of the rabbit failed to reveal any tuberculous lesion; we regard the finding of bacilli in this instance as an interesting but chance occurrence.

TABLE III.—PERSISTENCE OF TUBERCLE BACILLI IN BLOOD (TWENTY-SEVEN-HOUR TEST)

Interval after Inoculation *	Amount of Blood Tested	Result
2 hours	5 c.c.	Tb.
3 "	5 "	"
4 "	5 "	"
5 "	5 "	"
21 "	5 "	"
23 "	5 "	"
25 "	5 "	"
27 "	5 "	"

* 1 mg. of bovine culture inoculated into ear vein.

It is difficult to form a satisfactory hypothesis to explain the mechanism by which bacteria are able to circulate hundreds of times within the blood-stream and persistently escape the tissue filters. The feebly virulent human type, as well as the bovine bacillus, was regularly found in the blood from three to twenty minutes after inoculation (Table IV). It is possible

TABLE IV.—PERSISTENCE OF TUBERCLE BACILLI IN BLOOD (THREE TO TWENTY MINUTE TESTS)

Interval after Inoculation	Amount of Blood Tested	Type and Amount of Culture	Result
3 minutes	5 c.c.	Human 1 mg.	Tb.
10 "	5 "	" 1 "	"
20 "	5 "	" 1 "	"
3 minutes	5 c.c.	Bovine 1 mg.	Tb.
10 "	5 "	" 1 "	"
20 "	5 "	" 1 "	"

that the bacilli cling to the walls of the vessels and escape the current of the circulation for considerable periods. However, in view of the lack of experimental data in this particular it is best to forego hypothesis. This is

likewise true in regard to efforts attempting to account for the difference in this respect between the virulent and the comparatively avirulent types of tubercle bacilli. It is not attributable, however, to a difference in the opsonic power of the blood; tests which we carried out, as well as those of others,[1] show that no clear distinction exists between the indices for the human and for the bovine types of tubercle bacilli.

In the course of the inoculation of rabbits' blood into guinea-pigs interesting toxic (anaphylactic) phenomena were frequently observed—abdominal distention, coma, spasm of the hind legs, scratching of the face, and other symptoms of this complex which are well known. These symptoms have been described by others,[2] following intraperitoneal inoculation of rabbit serum, as well as local necrosis,[3] which, however, we did not encounter in the course of our many subcutaneous injections. It seemed to us as if the toxic symptoms were more frequent and more marked where blood was injected from rabbits suffering from bovine tuberculosis. Accordingly we undertook an extended series of tests to gain a clearer understanding of this reaction. It became evident that our impression was correct, that pigs injected with normal blood or the blood of rabbits inoculated with a culture of the human tubercle bacillus reacted less regularly and with less intensity than did those inoculated with an equal amount of the blood of rabbits suffering from tuberculosis of the bovine type. Guinea-pigs inoculated with the blood from the "bovine rabbits" frequently died with symptoms simulating anaphylactic shock. Serum stored in the refrigerator for some days retained this toxic property. The toxicity cannot be explained by the fact that in the one case we were testing the blood of a markedly diseased animal, and in the other that of an animal which was almost normal, for the blood of rabbits suffering from rabies did not possess similar toxic properties. In this connection it should be mentioned that Friedberger and Schütze[4] were able to extract anaphylotoxin in the test-tube from tubercle bacilli by adding normal guinea-pig serum and complement. The amount of toxin obtained varied according to the proportion of antigen, serum, and complement used and the period of extraction. Our results constitute a confirmation in vivo of these test-tube experiments; their lack of absolute regularity must be attributed to the variability of the diverse controlling factors.

CONCLUSIONS

For an experiment such as we set ourselves, namely, to determine the relation of virulence of bacteria to their persistence within the blood-stream,

the tubercle bacillus would seem to be especially suitable. Apart from the fact that it multiplies so slowly, that this factor is negligible in a test of short duration, it occurs in two types—one feebly virulent to rabbits, the other highly virulent. Morphologically, these bacteria are almost identical: their preëminent difference is one of virulence. Accordingly, definite quantities of these closely related microörganisms were inoculated into rabbits, and bleedings were carried out from one-half to four hours later, to discover whether bacilli were still circulating in the blood. In a series of tests of this nature it was found that the feebly virulent human type of bacillus was present in only 9 per cent. of the tests, whereas the virulent bovine bacillus persisted in the blood-stream in 59 per cent. of the cases. These results seem to warrant the conclusion that virulence plays an important rôle in bacteremia, and that the bacteria may not be filtered from the blood by the tissues like inert foreign bodies. The fact that an avirulent bovine strain did not persist in the circulation strengthened us in this conclusion.

It is remarkable for how long a period after inoculation bacteria may still be found in the general circulation. In one instance where but 1 mg. of bovine culture was inoculated these bacilli were constantly found in the blood at various intervals during the subsequent twenty-seven hours. A period intervenes some days after inoculation, during which even the virulent organisms are not found in the blood. However, this constitutes merely an intermediate or latent phase, and is followed by a cycle in which, owing to the tuberculous condition of the animal, there is a reinvasion of the general circulation. For example, in tests performed a week or two subsequent to inoculation no bacilli were found, whereas in tests repeated a month later, when systemic tuberculosis had developed, bacilli were frequently demonstrated. These generalizations are subject to exception, for example, in the case of one animal where, although tubercle bacilli were obtained from the blood, autopsy some weeks later failed to reveal any tuberculous lesion.

In the course of a large series of injections the interesting and suggestive phenomenon was noted, namely, that the blood of the highly tuberculous rabbit is more toxic for the guinea-pig than that of the normal rabbit.

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THE BACTERIOLOGY OF THE BLOOD IN PULMONARY TUBERCULOSIS: A PRELIMINARY REPORT

By Lawrason Brown, M.D., and S. A. Petroff
Trudeau, N. Y.

I. Tubercle Bacilli in the Blood

The publication during the past year of articles by German and Japanese workers on the occurrence of tubercle bacilli in the circulating blood of patients with pulmonary tuberculosis, led us to take up again this subject. We might say that several years ago Dr. Baldwin in the Saranac Lake laboratory inoculated guinea-pigs with blood from 16 tuberculous individuals, with negative results. We inoculated the blood of thirty patients into the abdominal cavity of guinea-pigs, using at first two and later but one guinea-pig for each patient and injecting 10 to 15 cm. of blood which had been mixed with a few drops of sodium citrate. Several of these pigs died, one of which had an acute pneumococcal peritonitis. Cultures of this patient's blood revealed a pure pneumococcus. The spleen was enlarged in all the guinea-pigs, but there was no evidence of any tuberculosis.

II. Secondary Organisms

Much work has been done in studying the question of secondary or mixed infection in pulmonary tuberculosis. Varying importance has been attributed to it in this disease, and many attempts to estimate its importance have been made. The sputum has been studied very carefully in nearly every particular, and much work done in isolating various organisms from carefully treated sputum. Such work shows that along with the tubercle bacillus in most instances secondary organisms have been found, which, in our experience, are usually the pneumococcus or some form of streptococcus, more rarely Bacillus Friedländer, staphylococcus, etc.

The pathological study of tissues has been made, but preagonal and postmortem invasion renders such work of doubtful importance.

On the clinical side, certain types of temperature curve, certain symp-

toms, the presence or absence of leukocytes, change in Arneth's neutrophilic picture, have all been adduced at one time or another as evidence of an invasion of secondary organisms. Again, the therapeutic test has been applied and autogenous vaccines prepared from sputum have been employed. But in pulmonary tuberculosis the results of such treatment have not been very satisfactory, and the evidence of the importance of secondary infection from this work has not been, to say the least, overwhelming. The isolation of the secondary organisms and the determination of the opsonic index have led some to believe that many patients with pulmonary tuberculosis suffer from secondary infection. Others have been unable to arrive at any satisfactory conclusion from a study of the opsonic index in regard to many organisms.

The whole subject of the presence of organisms other than the tubercle bacillus in the circulating blood was carefully reviewed before this Association last year by Dr. R. T. Pettit, and I will not again go over it. Long interested in secondary infection, we had made a few blood cultures before we saw Dr. Pettit's work, and as they had all been negative, we laid the work aside. His results, however, led us to take up again the study of the infection of the circulating blood, and today we wish to report the results we have obtained up to this time.

The technic employed was as follows: The skin over a large superficial vein of the forearm, usually the median basilic, was painted with the ordinary tincture of iodin and 20 c.c. of blood were collected, often by the aid of suction, into a 50 c.c. centrifugal tube, tightly closed by a rubber stopper with two holes through which glass tubes passed. To one was attached a rubber tube fitted with a needle, to the other a large rubber tube through which suction was made. The blood was allowed to flow through the end of one of these tubes directly into the following media:

1. Neutral glucose broth.
2. Serum-glucose broth.
3. Neutral glucose agar.
4. Acid (1 per cent.) glucose agar.
5. Neutral plain agar.
6. Serum-glucose agar.
7. Litmus milk.

All the inoculated media were examined every day for from three to five days at first and later for ten or eleven days until a growth appeared.

At the end of the first forty-eight hours a subculture from the broth was always made upon serum-agar slants, neutral broth, and glucose and plain agar plates.

In differentiating streptococcus from pneumococcus we have followed these principles: First, allorganisms which precipitated serum-agar media (Libman) and did not coagulate at the end of three days' inulin-serum water, were classified as streptococcus. Second, those organisms which failed to precipitate serum-agar media, but coagulated at the end of three days' inulin-serum water, were classified as pneumococcus.

Three strains of streptococcus were isolated, which we have called Streptococcus hæmolyticus, Streptococcus non-hæmolyticus, and Streptococcus viridans.

First: *Streptococcus Hæmolyticus.*—Broth not turbid, clear red in color, with a slight flaky precipitation. Colonies on glucose-agar plates highly hemolytic, white to gray, slightly raised, moist. In all the cases litmus milk gave acid reaction and in the majority coagulation followed after forty-eight hours' incubation.

Second: *Streptococcus Non-hæmolyticus.*—Broth turbid, dark red to brown, with no sediment. Glucose-agar plates, non-hemolytic, grayish, slightly moist, with a granular border and with an amorphous internal structure microscopically, chains formed of 8 to 15 organisms. Litmus milk in practically all the cases was acid and coagulated. On glucose-serum agar colonies appeared at the end of twenty-four hours as a scant growth. Abundant growth in the water of condensation. The growth in the stab more luxuriant than on the surface. Media highly precipitated.

Blood Cultures	Febrile		Afebrile		Total
	+	0	+	0	
Incipient	1	0	1	8	10
Moderately advanced	8	5	5	20	44
Far advanced	5	4	0	0	9
	14	9	6	34	63

Blood Cultures	Open		Closed		Total
	+	0	+	0	
Incipient	1	0	1	8	10
Moderately advanced	11	19	2	12	44
Far advanced	5	4	0	0	9
	17	23	3	20	63

Third: *Streptococcus Viridans.*—In only one instance was this strain of streptococcus isolated. Broth appeared clear. The colonies, which were very few in number, were isolated from the edges of the coagulum in the broth. No changes took place in the milk or the plates. The colonies on serum-agar slants appeared minute, cretaceous, brittle, non-hemolytic, hard to remove from the surface of the slants.

TABLE I.—INCIPIENT

Series No.	Days of Incubation	Results	Temperature
a. Open:			
17.21	4 days	Strept. hæmolyticus	99.8°
b. Closed:			
17.30	10 days	Negative	98.6°
17.31	10 days	Negative	98.6°
17.36	10 days	Negative	98.6°
17.47	10 days	Negative	98.6°
17.49	10 days	Negative	98.6°
17.53	10 days	Negative	98.6°
17.57	4 days	Pneumococcus	98.6°
17.61	10 days	Negative	98.6°
17.55	10 days	Negative	98.6°

TABLE II.—MODERATELY ADVANCED, CLOSED

Series	Days of Incubation	Results	Temperature
17.5	4 days	Negative	98.6°
17.33	10 days	Negative	98.6°
17.34	10 days	Negative	98.6°
17.35	10 days	Negative	98.6°
17.45	6 days	Strept. viridans	99.6°
17.46	10 days	Negative	98.6°
17.48	10 days	Negative	98.6°
17.51	10 days	Negative	98.6°
17.52	10 days	Negative	98.6°
17.54	10 days	Negative	98.6°
17.56	10 days	Negative	98.6°
17.58	10 days	Negative	98.6°
17.59	10 days	Negative	98.6°
17.60	4 days	Strept. non-hæmolyticus	98.6°

In all, the streptococcus was recovered from the blood of thirteen patients and included three strains of the organism, the Streptococcus hæmolyticus in 7 cases, the Streptococcus non-hæmolyticus in 5 cases, and Streptococcus

viridans in 1 patient. The pneumococcus occurred in 7 patients. In regard to the relation of these organisms to rise of temperature, it might be stated that 6 of the patients whose blood contained Streptococcus hæmolyticus had elevated temperature and one had temperature of 99°. Two of those with Streptococcus non-hæmolyticus had an elevated temperature, one a temperature of 99°, and two a normal temperature, while the patient with Streptococcus viridans had a temperature of 99.6°. Of the 7 patients in whose blood the pneumococcus occurred, the temperature was normal four times, elevated in two cases, and 99° in one.

TABLE III.—MODERATELY ADVANCED, OPEN

Series No.	Days of Incubation	Results	Temperature
17.1	5 days	Negative	99°
17.2	3 days	Negative	100°
17.3	3 days	Negative	101°
17.4	4 days	Negative	100°
17.6	3 days	Negative	98.6°
17.7	3 days	Pneumococcus	98.6°
17.8	4 days	Negative	98.6°
17.9	4 days	Negative	98.6°
17.10	5 days	Negative	98.6°
17.11	3 days	Pneumococcus	98.6° same organism from 9 p.
17.12	5 days	Negative	98.6°
17.13	5 days	Negative	98.6°
17.14	3 days	Negative	98.6°
17.16	4 days	Pneumococcus	98.6°
17.17	5 days	Negative	98.6°
17.18	4 days	Strept. non-hæmolyticus	98.6°
17.19	6 days	Negative	98.6°
17.20	5 days	Negative	98.6°
17.22	5 days	Negative	98.6°
17.23	5 days	Negative	98.6°
17.24	5 days	Negative	98.6°
17.40	4 days	Strept. hæmolyticus	100.5°
17.42	4 days	Strept. non-hæmolyticus	101°
17.43	4 days	Pneumococcus	101°
17.44	10 days	Negative	100°
17.62	10 days	Negative	98.6°
17.70	3 days	Strept. hæmolyticus	100°
17.72	3 days	Pneumococcus	99°
17.74	4 days	Strept. non-hæmolyticus	99°
17.75	3 days	Strept. hæmolyticus	99°

The results obtained may be briefly summarized. In ten patients in the incipient stage, the one "open" case contained Streptococcus hæmolyticus and had a temperature of 99.8°, and one of the nine "closed" cases, all with normal temperature, contained the pneumococcus.

TABLE IV.—FAR ADVANCED, OPEN

Series No.	Days of Incubation	Results	Temperature
17.15	3 days	Negative	100.5°
17.32	4 days	Strept. hæmolyticus	100.5°
17.37	10 days	Negative	100.5°
17.38	3 days	Strept. hæmolyticus	100°
17.39	3 days	Pneumococcus	102°
17.41	4 days	Strept. non-hæmolyticus	102°
17.50	3 days	Strept. hæmolyticus	100°
17.71	10 days	Negative	99.5°
17.73	10 days	Negative	100°

Forty-four patients in a moderately advanced stage were studied, fourteen of whom were "closed" and thirty "open." Of the fourteen "closed" cases, two yielded positive cultures, Streptococcus non-hæmolyticus and Streptococcus viridans. The former had an occasional maximal temperature of 99.6°, while the other thirteen patients had a normal temperature. Of the thirty "open" cases, eleven had organisms in the blood, pneumococcus five times, Streptococcus hæmolyticus four times, and Streptococcus non-hæmolyticus once. In four out of the five patients with pneumococci the temperature was normal, four of those with Streptococcus hæmolyticus were febrile, but the patient with Streptococcus non-hæmolyticus was afebrile. In all, thirteen of these forty-four patients had fever, and organisms were found in the blood of eight, while of the thirty-one afebrile in only five were organisms recovered.

In nine patients in a far-advanced stage, Streptococcus hæmolyticus occurred three times and Streptococcus non-hæmolyticus and pneumococcus once each. All these patients had some elevation of temperature, though one in whom the blood gave negative cultures had only slight departure from normal temperature. All were open cases.

After obtaining these results we questioned whether or not apparently normal individuals might not at some time have organisms in their blood-

stream. So far we have been able to obtain blood from only twelve healthy persons (11 men, 1 woman), and obtained no growth of any sort at the end of ten days.

Briefly, it may be said that 20 per cent. of the incipient, 27 per cent. of the moderately advanced, and 55 per cent. of the far-advanced patients had streptococci or pneumococci in their blood, that patients with fever are much more likely to have positive blood cultures than the afebrile, and that patients with definite ulceration in the lungs are several times more likely to show positive results than those in whom no ulceration has been proved.

DISCUSSION ON PAPERS BY DR. HESS AND DRS. BROWN AND PETROFF

Dr. Edward R. Baldwin, Saranac Lake: I have been much interested in Dr. Brown's study at the sanatorium. There are two things which I feel ought to be especially emphasized, and it is unnecessary to discuss them, but simply to point them out: First, the continued negative results of inoculations of blood from the standpoint of finding living tubercle bacilli in the blood; second, that a bacterium apparently exists in the blood of a great many cases of tuberculosis with very mild symptoms; that is, bacteria can be found in the blood in patients who apparently are doing well, and not only bacteria which will submit to all tests for their special kinds, but apparently have virulence, as he showed in one case. These results, so far as I know, have not been obtained previously, and the work certainly needs to be further brought into relation with the clinical study of patients. It is highly important to the men who are interested in sanatorium work to follow up this wherever they can with laboratory facilities.

Dr. William H. Park, New York: As we develop and improve our technic we find organisms under conditions in which we formerly failed because of poor technic. The increase of bacteria is often apparent rather than real.

The National Association for the Study and Prevention of Tuberculosis

CONSTITUTION AND BY-LAWS

LIST OF MEMBERS

October 1, 1912

CONSTITUTION AND BY-LAWS

CONSTITUTION

Article I.—Name

The name of this Society shall be The National Association for the Study and Prevention of Tuberculosis.

Article II.—Objects

The objects of the Association shall be: (*a*) The study of tuberculosis in all its forms and relations; (*b*) the dissemination of knowledge concerning the causes, treatment, and prevention of tuberculosis; (*c*) the encouragement of the prevention and scientific treatment of tuberculosis.

Article III.—Meetings

The meetings shall be held at such times and in such places as may be directed under the By-Laws.

BY-LAWS

Article I.—Membership

This Association shall consist of three classes of members: (*a*) Members; (*b*) Life Members; (*c*) Honorary Members.

(*a*) Those persons who participated in the organization of the Association at the meeting in Philadelphia on March 28, 1904, and such persons as shall from time to time be elected by the Board of Directors shall be Members so long as they comply with the provisions of the By-Laws. The dues of Members shall be Five Dollars ($5) a year.

(*b*) Members may become Life Members upon the payment of Two Hundred Dollars ($200).

(*c*) Persons distinguished for original researches relating to tuberculosis, or eminent as sanitarians, or as philanthropists who have given material aid in the Study and Prevention of Tuberculosis may be elected Honorary Members.

Article II.—Board of Directors

Section 1. The Association shall, at its first meeting, elect a board of thirty directors, divided into five groups of six each, to serve one, two, three, four, and five years, the duration of office to be determined by lot; thereafter, retiring directors, who have served a full term of five years, shall not be eligible for reëlection the year of retirement; provided, however, that this restriction shall not apply to the secretary or treasurer.

The Board of Directors may hereafter, at the annual meeting or at a special meeting of the Association, be increased to at least sixty, the additional members to be divided into groups in accordance with the provisions of the preceding paragraph of this section and subject to the same restrictions. It is furthermore provided that at least one-third of the total membership of the Board shall consist of laymen. At annual meetings succeeding the increase of the Board of Directors to a membership of sixty, twelve directors shall be elected for terms of five years, or, in case of vacancies in any of the groups, for such unexpired terms.

Section 2. The Board of Directors shall make its own rules; the government of the Association, the planning of work, the arrangement for meetings and congresses, and all other matters appertaining to legislation and direction shall be in its hands; committees shall have the power to execute only what is directed by the Board.

Article III.—Election of Officers

The Board of Directors shall annually elect from its own number a President, two Vice-Presidents, a Secretary, and a Treasurer, who shall be the officers of the Association as well as of the Board.

Article IV.—Committees

Section 1. The Board of Directors shall appoint an Executive Committee of seven directors, of which the President and the Secretary shall be members *ex officio*, to which shall be entrusted all the executive work of the Association.

SECTION 2. The Board of Directors is empowered to appoint representatives on the International Committee on Tuberculosis; it shall also from time to time appoint such committees as may be necessary for scientific and educational work, and for the holding of meetings and congresses.

ARTICLE V.—QUORUM

Seven Directors shall constitute a quorum of the Board of Directors.

ARTICLE VI.—MEETINGS

There shall be at least one stated annual meeting of the Association at a time and place to be fixed by the Board of Directors. Other meetings of the Association may be called by the Board at such times as it shall deem proper. The Executive Committee shall hold stated and other meetings as may be directed by the rules of the Board of Directors.

ARTICLE VII.—MONEYS

The moneys received from membership dues and from all other sources shall be used for defraying the expenses of the Association, and for furthering its objects under the direction of the Board of Directors.

ARTICLE VIII.—AMENDMENT OF CONSTITUTION

Propositions to amend the Constitution may be presented in writing at any meeting of the Board of Directors or of the Association; they shall be then referred to the Board of Directors for consideration and report. The Board of Directors shall report all propositions for amendment, whether submitted to it originally or by reference, at the meeting of the Association next following, when action may be taken; *provided, however*, that no proposition for amendment shall be voted upon within thirty days after its presentation, or without at least twenty days' notice of the meeting at which it is to come up for consideration, which notice shall set forth the proposed amendment in full. An affirmative vote of two-thirds the members present shall be required for adoption.

ARTICLE IX.—AMENDMENT OF BY-LAWS

By-Laws may be amended in the same manner as the Constitution or by a two-thirds vote of the members present at a meeting of the Board of Directors, provided that in the latter case the proposition to amend has been presented in writing at a previous meeting of the Association, or of the Board of Directors, and that subsequently to such presentation twenty days'

notice in writing has been given of the proposed amendment in the call for the meeting.

Article X.—Advisory Council

The Advisory Council of The National Association for the Study and Prevention of Tuberculosis shall consist of:

First. Directors of the Association.

Second. Officers or representatives appointed by various recognized State associations for the prevention of tuberculosis, such representatives being required to qualify as members of the National Association, the number in any case not to exceed five.

Third. Officers or representatives of various recognized local or municipal associations for the prevention of tuberculosis, such representatives being required to qualify as members of the National Association, the number in any case not to exceed three.

Fourth. A member of the medical staff of every public hospital or sanatorium for the exclusive care of tuberculous patients, such member to be designated by the board of trustees or other authorities of the hospital or sanatorium, such representative being required to qualify as a member of the National Association.

Fifth. A representative from the board of trustees or other executive authorities of approved hospitals or sanatoria for the exclusive care of tuberculous patients, such representative being required to qualify as a member of the National Association.

Sixth. Representatives of recognized, incorporated charitable societies or associations, such representatives being required to qualify as members of the National Association, the number in any case not to exceed three.

Seventh. The president or medical officer of the Health Department of any State or any city with a population of more than twenty thousand may become *ex officio* a member of the Advisory Council during his term of office.

The Advisory Council shall meet at the time of the annual meeting of the Association, and at such other times as it may be called together by the Directors or the President of the National Association. During the meetings of the National Association the Advisory Council shall have regular stated meetings at which members of the Council may bring up for discussion, or may present papers, which have been approved, bearing on the administrative control of tuberculosis, the management of hospitals and sanatoria, may make recommendations to the Board of Directors with regard to the conduct of the National Association, and other related subjects.

GEOGRAPHICAL LIST OF MEMBERS

HONORARY MEMBER

Trudeau, Dr. Edward L., Saranac Lake, N. Y.

LIFE MEMBERS

Blumenthal, George, New York
Carnegie, Andrew, New York
Clark, F. A., New York
Fisk, Harvey Edward, New York
Frick, Henry C., New York
Harkness, Edward S., New York
Henszey, William P., Philadelphia
Higginson, Henry L., Boston
Knickerbacker, Mrs. H., New York
Knopf, Dr. S. Adolphus, New York
Langdon, Woodbury G., Morristown, N. J.
Lea, Henry C., Philadelphia
Lewisohn, Adolph, New York
McCormick, Cyrus H., Chicago
Macy, V. Everit, New York
Maloney, Martin, Philadelphia
Marshall, Louis, New York
May, Francis E., Chicago
Morgan, J. P., New York
Phipps, Henry, New York
Rockefeller, John D., New York
Schiff, Jacob H., New York
Wanamaker, Rodman, Philadelphia
Warburg, Felix M., New York

GEOGRAPHICAL LIST OF THE MEMBERS OF THE NATIONAL ASSOCIATION FOR THE STUDY AND PREVENTION OF TUBERCULOSIS, OCTOBER 1, 1912

ALABAMA

ALLEN, B. M., 303 Farley Building, Birmingham, Ala.
ANDREWS, DR. GLENN, Montgomery, Ala.
CARY, DR. C. A., Alabama Polytechnic Institute, Auburn, Ala.
EAVES, REV. GEORGE, 1112 Elm Street, Birmingham, Ala.
FRICKS, DR. L. D., Mobile Quarantine, Fort Morgan, Ala.
GRAHAM, JOHN Y., Anti-Tuberculosis Association of Tuscaloosa County, Tuscaloosa, Ala.
GREIL, DR. GASTON J., Box 269, Montgomery, Ala.
HARKNESS, DR. R. B., Birmingham, Ala.
JACKSON, DR. WILLIAM R., Medical College of Alabama, Mobile, Ala.
LANGLEY, DR. ORLANDO, 514 Avenue A, Opelika, Ala.
LULL, DR. CABOT, 421 First National Bank Building, Birmingham, Ala.
PRICE, ALBERT B., Gordo, Ala.
STOVALL, DR. A. M., Jasper, Ala.
THIGPEN, DR. C. A., Montgomery, Ala.
WILSON, DR. CUNNINGHAM, 1107 South 20th Street, Birmingham, Ala.

ARIZONA

BREID, DR. JACOB, United States Indian School, Phoenix, Ariz.
DUNLAP, H. M., Phoenix, Ariz.
FLINN, DR. JOHN W., Pamsetgaaf among the Pines, Prescott, Ariz.
MARDEN, DR. A. E., United States Indian School, Phoenix, Ariz.
METZGER, DR. JEREMIAH, Tucson-Arizona Sanatorium, Tucson, Ariz.
RODGERS, DR. MARK A., Tucson, Ariz.
YOUNT, DR. C. E., Prescott, Ariz.

ARKANSAS

BAYNHAM, DR. C. W., Little Rock, Ark.
BOSWORTH, DR. ROBINSON, Arkansas State Sanatorium, Booneville, Ark.
SHIBLEY, DR. J. S., Arkansas State Sanatorium, Booneville, Ark.
SOUTHARD, DR. JEFFERSON D., 101 North Sixth Street, Fort Smith, Ark.

CALIFORNIA

ALLEN, DR. H. W., 240 Stockton Street, San Francisco, Cal.
AUCHINCLOSS, HENRY B., P. O. Box 2, Redlands, Cal.
BAGG, DR. C. P., 1024 Arapahoe Street, Los Angeles, Cal.
BAKER, DR. GEORGE S., 407 Post-Office Building, San Francisco, Cal.
BARLOW, DR. W. JARVIS, 616 Security Building, Los Angeles, Cal.
BINE, DR. RENÊ, 350 Post Street, San Francisco, Cal.
BOOTHE, C. B., 1515 Garfield Avenue, South Pasadena, Cal.
BOWEN, WILLIAM A., 500 Equitable Building, Los Angeles, Cal.

Boyd, Dr. Walter M., 119½ South Spring Street, Los Angeles, Cal.
Braun, F. W., Los Angeles, Cal.
Bridge, Dr. Norman, Temple Auditorium, 5th & Olive Streets, Los Angeles, Cal.
Briggs, Dr. Wallace A., Box 667, Sacramento, Cal.
Brodrick, Dr. R. G., 1547 Jackson Street, San Francisco, Cal.
Brooks, Dr. Stephen Driver, 543 Wilcox Building, Los Angeles, Cal.
Brown, Dr. Philip King, 350 Post Street, San Francisco, Cal.
Brown, Dr. Rexwald, Aiken Block, Santa Barbara, Cal.
Browning, Dr. Charles C., 1004 Story Building, Los Angeles, Cal.
Bush, Dr. Chesley, Colfax School for the Tuberculous, Colfax, Cal.
Cheney, Dr. William Fitch, Shreve Building, San Francisco, Cal.
Cochran, George I., President, Pacific Mutual Life Insurance Company, Los Angeles, Cal.
Coffin, Franc Nixon, 322 Consolidated Realty Building, Los Angeles, Cal.
Cox, Dr. Thomas J., Sacramento, Cal.
Cravens, John S., 1008 Trust and Savings Building, Los Angeles, Cal.
Crouse, Mrs. Otto, 26 Kennebec Avenue, Long Beach, Cal.
Cutter, E. A., Cutter Laboratory, Berkeley, Cal.
Dice, Dr. S. D., 136 North Orange Street, Hollywood, Cal.
Egan, William F., 1155 Golden Gate, W., San Francisco, Cal.
Elliott, J. M., First National Bank Building, Los Angeles, Cal.
Evans, Dr. George H., 133 Geary Street, San Francisco, Cal.
Farris, Dr. C. M., 1010½ J Street, Sacramento, Cal.
Fly, Dr. Edward M., National City, Cal.
Ford, Tod, 257 Grand Avenue, Pasadena, Cal.
Gilbert, William B., Sausalito, Marion Co., Cal.
Gleeson, Rev. Richard A., Santa Clara College, Santa Clara, Cal.
Gosney, E. S., 622 Chamber of Commerce Building, Pasadena, Cal.
Griffith, Miss Alice S., 2608 Webster Street, San Francisco, Cal.
Halsted, S. Hazard, Pasadena Ice Company, Pasadena, Cal.
Hare, Dr. George A., Fresno County Land Company Building, Fresno, Cal.
Haynes, Dr. John R., 945 S. Figueroa Street, Los Angeles, Cal.
Hendry, George W., 46 Clay Street, San Francisco, Cal.
Hines, Dr. I. B., 1010 J Street, Fresno, Cal.
Hirschfelder, Dr. J. O., 1392 Geary Street, San Francisco, Cal.
Howard, Dr. Burt F., Alta, Cal.
Johnson, Bishop Joseph H., Los Angeles, Cal.
Kirschner, Dr. Harry E., Pottenger Sanatorium, Monrovia, Cal.
Kress, Dr. George H., 240 Bradbury Building, Los Angeles, Cal.
Lavenson, Dr. R. S., 972 Arapahoe Street, Los Angeles, Cal.
Lyle, Dr. Annie G., 1150 Franklin Street, San Francisco, Cal.
McBride, Dr. James H., Pasadena, Cal.
Martyn, Dr. G., 821 Security Building, Los Angeles, Cal.
Mattison, Dr. F. C. E., Chamber of Commerce Building, Pasadena, Cal.
Moffitt, Dr. Herbert C., 240 Stockton Street, San Francisco, Cal.
Moseley, Dr. Gayle G., Redlands, Cal.
Ophüls, Dr. William, Cooper Medical College, San Francisco, Cal.
Peers, Dr. Robert A., Colfax, Cal.
Pomeroy, Dr. John L., 212 American National Bank Building, Monrovia, Cal.
Pottenger, Dr. F. M., Monrovia, Cal.
Pringle, Mrs. J. R., Box 124, Weed, Cal.
Reinhardt, Dr. G. F., 2345 Telegraph Avenue, Berkeley, Cal.
Rixford, Dr. Emmet, 2694 Sacramento Street, San Francisco, Cal.
Robinson, Dr. Frank N., Pottenger Sanatorium, Monrovia, Cal.
Ross, Dr. John W., R. F. D. 1, Pasadena, Cal.
Shepard, Dr. Charles A., Needles, Cal.
Sherman, Dr. Harry M., Union Square Building, San Francisco, Cal.
Sherman, Gen. M. H., Westminster Hotel, Los Angeles, Cal.

Sleeper, Dr. Karl R., 308 Loring Theatre Building, Riverside, Cal.
Snow, Dr. William F., Secretary, State Board of Health, Sacramento, Cal.
Stillman, Dr. Stanley, 708 Market Street, San Francisco, Cal.
Symmes, Frank J., 441 California Street, San Francisco, Cal.
Tade, Frank, 1011 (a) Eye Street, Sacramento, Cal.
Tade, J. E., 1011 (b) Eye Street, Sacramento, Cal.
Tyler, Dr. Hoell, Redlands, Cal.
Van Zwaluwenburg, Dr. C., Riverside, Cal.
Visscher, Dr. L. G., 524 Homer Laughlin Building, Los Angeles, Cal.
von Adelung, Dr. Edward, Bank of Savings Building, Oakland, Cal.
Whitney, Dr. James L., 240 Stockton Street, San Francisco, Cal.
Wildanger, Dr. F. J., Elk Grove, Cal.
Withington, Frederic S., care of Western States Life Insurance Company, First National Bank Building, San Francisco, Cal.

CANADA

Amyot, Col. George E., 45, Dorchester, Quebec, Que.
Armstrong, Dr. G. E., 320 Mountain Street, Montreal, Que.
Beatty, Dr. James C., Gravenhurst, Ont.
Burland, Col. Jeffrey H., 2 Place d'Armes, Montreal, Que.
Byers, Dr. J. Roderick, St. Agathe des Monts, Que.
Caulfield, Dr. A. H., Gravenhurst, Ont.
Chown, Dr. H. H., 263 Broadway, Winnipeg, Man.
Deimel, Francis, care of the Deimel Linen-Mesh Company, 416 St. Catherine Street, W., Montreal, Que.
Dobbie, Dr. W. J., Toronto Free Hospital for Consumptives, Weston, Ont.
Dubé, Dr. J. E., 232 Sherbrooke Street, W., Montreal, Que.
Elliott, Dr. J. H., 11 Spadina Road, Toronto, Ont.
Fagan, Dr. C. J., Provincial Board of Health, Victoria, B. C.
Fairbank, Dr. C. O., Petrolia, Ont.
Grenier, Dr. Eugene, 707 St. Hubert Street, Montreal, Que.
Hart, Dr. William M., Regina, Sask.
Hodgetts, Dr. Charles Alfred, Commission of Conservation, Ottawa, Ont.
Holbrook, Dr. J. H., Mountain Sanatorium, Hamilton, Ont.
Irving, Dr. R. W., Tranquille Sanatorium, Kamloops, B. C.
Klotz, Dr. Julius E., 437 Albert Street, Ottawa, Ont.
Lessard, Dr. Alfred, Secretary, Anti-Tuberculosis League of Quebec, 133 Boulevard Langelier, Quebec, Que.
McLeod, John W., Antigonish, Nova Scotia
Malloch, Dr. A. E., 28 Duke Street, Hamilton, Ont.
Martin, Dr. Charles F., The Sherbrooke, Montreal, Que.
Miller, Dr. Arthur Frederick, Provincial Sanatorium, Kentville, Nova Scotia
Millman, Dr. T., Temple Building, Toronto, Ont.
Montozambert, Dr. F., Public Health Department, Ottawa, Ont.
Ogden, Dr. W. E., Muskoka Free Hospital for Consumptives, Gravenhurst, Ont.
Parfitt, Dr. Charles D., Gravenhurst, Ont.
Paterson, Dr. Robert, St. Agathe des Monts, Que.
Porter, Dr. George D., 162 Crescent Road, Toronto, Ont.
Primrose, Professor A., 100 College Street, Toronto, Ont.
Rousseau, Dr. Arthur, University of Laval, 2 Collins Street, Quebec, Que.
Seymour, Dr. M. M., Commissioner of Public Health, Regina, Sask.
Simpson, R. M., 216 McIntyre Block, Winnipeg, Man.
Stevenson, Elliott J., Temple Building, Toronto, Ont.
Stewart, Dr. David A., Ninette, Man.
Townsend, Dr. David, Gordan Memorial Sanatorium, River Glade, N. B.
Turner, Hon. Richard, Quebec, Que.
Vrooman, Dr. C. H., Tranquille Sanatorium, Kamloops, B. C.

COLORADO

ANDERSON, DR. G. M., Main Street, Fort Morgan, Colo.
ARNEILL, DR. JAMES R., 430 Majestic Building, Denver, Colo.
BEGGS, DR. WILLIAM N., 1403 Delaware Street, Denver, Colo.
BERGTOLD, DR. WILLIAM H., 1159 Race Street, Denver, Colo.
BERLIN, DR. W. C. K., 202 Symes Building, Denver, Colo.
BLACKMAN, DR. ALFRED A., 1806 Wood Avenue, Colorado Springs, Colo.
BONNEY, DR. S. G., Stedman Building, Denver, Colo.
BOYD, DR. LOUIE CROFT, City and County Hospital, Denver, Colo.
BROWN, DR. L. GORDON, 118 East Monument Street, Colorado Springs, Colo.
BURNETT, DR. CLOUGH TURRILL, Boulder, Colo.
CAMPBELL, DR. W. A., 424 North Nevada Avenue, Colorado Springs, Colo.
CAUSEY, JAMES H., Ideal Building, Denver, Colo.
COLLINS, DR. MOSES, National Jewish Hospital for Consumptives, Denver, Colo.
CORWIN, DR. R. W., Minnequa Hospital, Pueblo, Colo.
DENNIS, DR. FRANK L., 130 East San Miguel Street, Colorado Springs, Colo.
EDSON, DR. CARROLL E., 305 McPhee Building, Denver, Colo.
ELSNER, JOHN, 1014 14th Street, Denver, Colo.
FORSTER, DR. A. M., Cragmor Sanatorium, Colorado Springs, Colo.
GARDINER, DR. CHARLES FOX, Colorado Springs, Colo.
GIBSON, DR. J. D., 430 Commonwealth Building, Denver, Colo.
GIESE, DR. CHARLES O., Modern Woodmen of America Sanatorium, Woodmen, Colo.
GILBERT, DR. G. BURTON, 817 North Cascade Avenue, Colorado Springs, Colo.
GILBERT, O. M., Boulder, Colo.
GILDEA, DR. PATRICK F., 2 North Cascade Avenue, Colorado Springs, Colo.
GODDARD, MRS. FRANCIS W., 808 North Cascade Avenue, Colorado Springs, Colo.
HALL, DR. J. N., 452 Metropolitan Building, Denver, Colo.
HARLOW, DR. W. P., Boulder, Colo.
HILLKOWITZ, PHILIP, 302 Metropolitan Building, Denver, Colo.
HOAGLAND, DR. HENRY W., 327 North Nevada Avenue, Colorado Springs, Colo.
HOLDEN, DR. G. W., Agnes Memorial Sanatorium, Denver, Colo.
HOWARD, DR. T. LEON, Metropolitan Block, Denver, Colo.
JONES, ASA T., 625 North Cascade Avenue, Colorado Springs, Colo.
JONES, DR. SAMUEL FOSDICK, Knights of Columbus Building, 14th and Glenarm Streets Denver, Colo.
LEVY, DR. ROBERT, California Building, Denver, Colo.
LITTLE, DR. WILBUR T., Cañon City, Colo.
LONG, DR. MARGARET, 1434 Glenarm Street, Denver, Colo.
LOOMIS, DR. P. A., 2 North Cascade Avenue, Colorado Springs, Colo.
MCCONNELL, DR. JOHN FRANCIS, 708 North Tejon Street, Colorado Springs, Colo.
MORRIS, S. POULTERER, Room 29, State Capitol, Denver, Colo.
MORSE, DR. GEORGE W., 227 Commonwealth Building, Denver, Colo.
PARSONS, DR. STEPHEN TYLER, 1312 Oneida Street, Denver, Colo.
PEABODY, DR. JAMES R., 327 North Nevada Avenue, Colorado Springs, Colo.
PHIPPS, LAWRENCE C., Denver, Colo.
POGUE, DR. GEORGE R., Greeley, Colo.
PULITZER, MISS CONSTANCE, 1221 North Cascade Avenue, Colorado Springs, Colo.
RAMALEY, FRANCIS, University of Colorado, Boulder, Colo.
REA, DR. GEORGE, Nordrach Ranch, Colorado Springs, Colo.
RUTLEDGE, DR. JAMES A., Modern Woodmen of America Sanatorium, Woodmen. Colo.
SCHULTZ, DR. LOUIS HUBER, Agnes Memorial Sanatorium, Denver, Colo.
SCHWATT, DR. H., Sanatorium, Jewish Consumptives Relief Society, Edgewater, Colo.
SCULLY, DR. DANIEL J., 1129 North Nevada Avenue, Colorado Springs, Colo.
SEWALL, DR. HENRY, 1360 Vine Street, Denver, Colo.
SHOBER, MRS. L. L., Broadmoor, Colorado Springs, Colo.
SHOEMAKER, DR. FERDINAND, 407 Railroad Building, Denver, Colo.
STEINER, DR. J. M., Agnes Memorial Sanatorium, Denver, Colo.

Swan, Dr. Will Howard, Colorado Springs, Colo.
Taussig, Dr. Arnold S., Metropolitan Building, 16th Street and Court Place, Denver, Colo.
Wallace, Dr. Joseph F., Modern Woodmen of America Sanatorium, Woodmen, Colo.
Waring, James Johnston, 1144 Race Street, Denver, Colo.
Watt, Dr. Henry C., 1440 North Nevada Avenue, Colorado Springs, Colo.
Webb, Dr. Gerald Bertram, 1222 North Cascade Avenue, Colorado Springs, Colo.
Wescott, Dr. Orville D., Agnes Memorial Sanatorium, Denver, Colo.
Wetherell, Dr. H. G., 505 California Street, Denver, Colo.
White, Dr. J. E., Nordrach Ranch Sanatorium, Colorado Springs, Colo.
White, Mrs. J. E., Nordrach Ranch Sanatorium, Colorado Springs, Colo.
Whitney, Miss Mary L., Cragmor Sanatorium, Colorado Springs, Colo.
Williams, Dr. Sherman, Metropolitan Building, Denver, Colo.
Williams, Dr. William Whitbridge, 1231 North Cascade Avenue, Colorado Springs, Colo.
Wright, Dr. Barton Lisle, U. S. Naval Hospital, Las Animas, Colo.

CONNECTICUT

Avery, Samuel P., 61 Woodland Street, Hartford, Conn.
Bartlett, Dr. William B., Wildwood Sanatorium, Hartford, Conn.
Beach, Dr. Charles C., 54 Woodland Street, Hartford, Conn.
Blumer, Dr. George, 64 Trumbull Street, New Haven, Conn.
Briggs, Thomas B., R. F. D. 1, Portland, Conn.
Carmalt, Dr. William H., 261 St. Ronan Street, New Haven, Conn.
Davis, Dr. G. Pierrepont, 56 Prospect Street, Hartford, Conn.
Dinnan, Dr. James B., Tuberculosis Sanatorium, Meriden, Conn.
Dunham, Sylvester C., Travelers' Insurance Company, Hartford, Conn.
English, Joel L., Hartford, Conn.
Farnam, Professor Henry W., New Haven, Conn.
Farnham, E. D., South Windsor, Conn.
Fisher, Professor Irving, 460 Prospect Street, New Haven, Conn.
Fleck, Dr. H. W., 495 Fairfield Avenue, Bridgeport, Conn.
Fromen, Dr. E. T., 262 Main Street, New Britain, Conn.
Greenway, Dr. James C., Greenwich, Conn.
Greenway, Mrs. James C., Kincraig, Greenwich, Conn.
Haskell, Dr. Charles N., 467 State Street, Bridgeport, Conn.
Hitchcock, Frederick S., President, New London Anti-Tuberculosis Society, New London, Conn.
Kellogg, Charles P., State Board of Charities, Waterbury, Conn.
Kerner, Eugene, Secretary, Associated Charities, Waterbury, Conn.
Kingsbury, Dr. Isaac William, 36 Pearl Street, Hartford, Conn.
Lyman, Dr. David R., Wallingford, Conn.
McDonald, Miss Jessie C., Lock Box 26, Farmington, Conn.
McFarland, Dr. D. W., Green Farms, Conn.
McKnight, Dr. E. J., 110 High Street, Hartford, Conn.
Maher, Dr. Stephen J., 212 Orange Street, New Haven, Conn.
Mariani, Dr. Nicola, 119 Greene Street, New Haven, Conn.
Messenger, H. J., Actuary, Travelers' Insurance Company, Hartford, Conn.
Osborne, Dr. Oliver T., 252 York Street, New Haven, Conn.
Osgood, Mrs. Mary R., 181 Broadway, Norwich, Conn.
Palmer, Mrs. I. E., 326 Washington Street, Middletown, Conn.
Pendleton, Dr. Wilson, Gaylord Farm Sanatorium, Wallingford, Conn.
Plummer, Dr. Paul, 119 North Beacon Street, Hartford, Conn.
Porter, Dr. William, Jr., 69 Forest Street, Hartford, Conn.
Riggs, Mrs. E. Francis, Ocean Avenue, New London, Conn.
Scofield, Miss Jane E., 232 Summer Street, Stamford, Conn.
Selleck, Dr. N., Danbury, Conn.
Smith, Ernest Walker, 847 Main Street, Hartford, Conn.

Steiner, Dr. Walter R., 4 Trinity Street, Hartford, Conn.
Stoll, Dr. Henry Farnum, 75 Pratt Street, Hartford, Conn.
Swain, Dr. Henry L., 232 York Street, New Haven, Conn.
Tod, Mrs. J. Kennedy, Innis Arden House, Sound Beach, Conn.
Wagner, Dr. Harry S., Hartford County State Tuberculosis Sanatorium, Hartford, Conn.
Warner, Miss Grace, Salisbury, Conn.
Warner, William A., New Haven, Conn.
Weber, Mrs. E. Y., 1160 Post Road, Stamford, Conn.
Whittemore, Harris, Naugatuck, Conn.

CUBA

Cabrera y Saavedra, Dr. Francisco, Merced 77, Havana, Cuba
Desvernine, Dr. C. M., 52 Cuba Street, Havana, Cuba
Jacobsen, Dr. J. L., Monserrate 2, Havana, Cuba
Martinez, Dr. Emilo, Nepturno 56, Havana, Cuba
Rivero, Dr. Filberto, San Ygnacio 43, Havana, Cuba

DELAWARE

Bissell, Miss Emily P., 1404 Franklin Street, Wilmington, Del.
Draper, Dr. James, 1015 Washington Street, Wilmington, Del.
Reed, Dr. Raymond C., Delaware College, Newark, Del.
Robin, Dr. Albert, 1202 Delaware Avenue, Wilmington, Del.
Swift, W. H., 1309 Delaware Avenue, Wilmington, Del.
Webb, Wesley, Dover, Del.

DISTRICT OF COLUMBIA

Acker, Dr. George N., 913 16th Street, Washington, D. C.
Allen, Dr. H. Jerome, 1616 I Street, Washington, D. C.
Baldwin, M. W., 3000 13th Street, N. W., Washington, D. C.
Baldwin, William H., 1415 21st Street, Washington, D. C.
Barnes, Dr. Noble P., 212 Maryland Avenue, N. E., Washington, D. C.
Barrie, Dr. George, 1601 22d Street, N. W., Washington, D. C.
Bauer, L. A., The Ontario, Washington, D. C.
Bicknell, Ernest P., American National Red Cross, Washington, D. C.
Boardman, Miss Mabel T., 1801 P Street, Washington, D. C.
Bowker, Dr. C. H., 1310 Vermont Avenue, Washington, D. C.
Brooke, Capt. Roger, Jr., Medical Corps, U. S. A., Washington, D. C.
Bryan, Dr. Joseph H., 818 17th Street, Washington, D. C.
Buchanan, Dr. William R., 1737 Park Road, Washington, D. C.
Cabaniss, Dr. George W., 1744 K Street, N. W., Washington, D. C.
Chatard, Thomas M., 1716 Rhode Island Avenue, Washington, D. C.
Clark, Appleton P., Jr., Union Trust Building, Washington, D. C.
Coblentz, Dr. Horace B., 1432 U Street, N. W., Washington, D. D.
Cohen, Max, 509 Seventh Street, N. W., Washington, D. C.
Coromilas, L. A., 2009 Columbia Road, Washington, D. C.
Craig, Capt. Charles F., Army Medical School, Washington, D. C.
Dorset, Dr. Marion, Bureau of Animal Industry, Washington, D. C.
Downey, William F., 1622 L Street, N. W., Washington, D. C.
Fremont-Smith, Dr. F., 1808 Massachusetts Avenue, Washington, D. C.
Gompers, Samuel, 801 G Street, Washington, D. C.
Gwynn, Dr. William C., 3336 O Street, N. W., Washington, D. C.
Hague, Arnold, 1724 I Street, Washington, D. C.
Hazen, Dr. H. H., 1204 18th Street, N. W., Washington, D. C.
Hotchkiss, Dr. Samuel, Public Health and Marine-Hospital Service, Washington, D. C.
James, Mrs. Julian, 1602 20th Street, Washington, D. C.
Jennings, Hennen, 2221 Massachusetts Avenue, Washington, D. C.

Kingsman, Dr. R., 711 East Capitol Street, Washington, D. C.
Knapp, Mrs. Nellie Maynard, Stoneleigh Court, Washington, D. C.
Kober, Dr. George M., 1819 Q Street, Washington, D. C.
Lee, Blair, Washington, D. C.
Lee, Dr. Thomas S., Stoneleigh Court, Washington, D. C.
Leupp, Hon. Francis E., 1813 16th Street, N. W., Washington, D. C.
Lindsey, Dr. John H., 3015 14th Street, N. W., Washington, D. C.
Lisner, Abram, Corner 11th and G Streets, Washington, D. C.
McDonald, Dr. George, 1204 G Street, N. W., Washington, D. C.
McKim, Dr. W. Duncan, 1701 18th Street, N. W., Washington, D. C.
McLaughlin, Mrs. Theodora North, 1721 Euclid Street, Washington, D. C.
Morgan, Dr. James D., 919 15th Street, N. W., Washington, D. C.
Morgan, Dr. William Gerry, The Rochambeau, Washington, D. C.
Newman, Dr. Henry Martel, 2403 Pennsylvania Avenue, Washington, D. C.
Newton, Mrs. Elsie Eaton, The Concord, Washington, D. C.
Parker, Henry P., 1518 Connecticut Avenue, N. W., Washington, D. C.
Pellew, Henry E., 1637 Massachusetts Avenue, Washington, D. C.
Pinchot, Gifford, Washington, D. C.
Pinchot, Mrs. James W., 1615 Rhode Island Avenue, Washington, D. C.
Ramsburgh, Dr. Jesse, The Portner, Washington, D. C.
Randolph, Dr. B. M., 20th and P Streets, N. W., Washington, D. C.
Richardson, Dr. Charles W., 1317 Connecticut Avenue, Washington, D. C.
Rives, Dr. William C., 1702 Rhode Island Avenue, Washington, D. C.
Rixey, Surgeon-Gen. P. M., Navy Department, Washington, D. C.
Robb, Hon. Charles H., Court of Appeals of the District of Columbia, Washington, D. C.
Ruffin, Dr. Sterling, 1335 Connecticut Avenue, Washington, D. C.
Russell, Rev. William T., D.D., St. Patrick's Rectory, Washington, D. C.
Shepherd, Mrs. A. R., 1917 Kalorama Road, Washington, D. C.
Smith, Dr. Erwin F., 1460 Belmont Street, Washington, D. C.
Sowers, Dr. William F. M., 1707 Massachusetts Avenue, Washington, D. C.
Sowers, Dr. Z. T., 1707 Massachusetts Avenue, Washington, D. C.
Sternberg, Gen. George M., 2005 Massachusetts Avenue, Washington, D. C.
Strasburger, Joseph, 310 7th Street, N. W., Washington, D. C.
Tewksbury, Dr. W. D., Supt., Tuberculosis Hospital of the District of Columbia, Washington, D. C.
Tuckerman, Miss E., 1712 H Street, Washington, D. C.
Ufford, Walter S., Secretary, Association for the Prevention of Tuberculosis of the District of Columbia, 923 H Street, N. W., Washington, D. C.
Walker, Dr. Reginald R., 1710 H Street, Washington, D. C.
Wilder, Dr. J. R., 2109 Pennsylvania Avenue, N. W., Washington, D. C.
Wood, Mrs. Albert Norton, 1827 S Street, Washington, D. C.
Wood, Rev. Charles, D.D., 2110 S Street, Washington, D. C.
Woodward, Robert S., 1513 16th Street, N. W., Washington, D. C.
Woodward, S. W., 2015 Wyoming Avenue, Washington, D. C.
Woodward, Dr. William C., 1766 Lanier Place, N. W., Washington, D. C.

ENGLAND

Gray, Edward, care of Brown, Shipley and Company, 123 Pall Mall, London, England
Osler, Sir William, Oxford University, Oxford, England

FLORIDA

Carnegie, Mrs. I. M., Fernandina, Fla.
Coachman, Walter F., P. O. Box 936, Jacksonville, Fla.
McGinnis, Dr. R. H., Jacksonville, Fla.
Porter, Dr. Joseph Y., State Health Officer, Jacksonville, Fla.
Souvielle, Dr. Mathieu, P. O. Box 355, Jacksonville, Fla.
Stevens, Dr. Ellen Lowell, 2050 Hill Street, Jacksonville, Fla.

FRANCE

MAGNIN, DR. A. J., 121 Boulevard Haussmann, Paris, France

GEORGIA

CLARK, DR. M. A., Georgia Life Building, Macon, Ga.
COLEMAN, DR. THOMAS D., 505 Greene Street, Augusta, Ga.
COLLINS, DR. KATHARINE R., Georgia State Board of Health Laboratory, Atlanta, Ga.
COMEY, DR. PERLEY P., The Hill, corner Walton Way and Telfair Streets, Augusta, Ga.
HALL, DR. MARION McH., 502 Prudential Building, Atlanta, Ga.
HARRIS, PROFESSOR HENRY F., Atlanta, Ga.
MERRITT, DR. S. WICKES, Battle Hill Sanatorium, Atlanta, Ga.
OERTEL, DR. THEODORE E., 638 Greene Street, Augusta, Ga.
PARRAMORE, DR. WILLIAM U., State Tuberculosis Sanatorium, Alto, Ga.
POWELL, DR. B. C., Villa Rica, Ga.
RANKIN, MISS JULIA T., Librarian Carnegie Library, Atlanta, Ga.
RAOUL, W. G., 708 Peachtree Street, Atlanta, Ga.
ROUGLIN, DR. LOUIS C., 757 Candler Annex, Atlanta, Ga.
SLACK, DR. HENRY R., LaGrange, Ga.
SMITH, DR. CLAUDE A., City Hill, Atlanta, Ga.
THRASH, DR. ELMORE C., 408 Fourth National Bank Building, Atlanta, Ga.

GERMANY

BENDHEIM, BERTHOLD, Scheffelstrasse 28, Frankfurt-am-Main, Germany
NEISSER, DR. MAX, Parkstrasse 67, Frankfurt, Germany

HAWAII

BOWEN, W. S., Box 514, Honolulu, Hawaii
CARTER, GEORGE R., Honolulu, Hawaii.
RATH, JAMES A., Secretary, Anti-Tuberculosis League of Honolulu, P. O. Box 514, Honolulu, Hawaii

IDAHO

BAKER, DR. E. T., University of Idaho, Moscow, Idaho.

ILLINOIS

Chicago (For remainder of State see below)

ABT, DR. I. A., 4810 Kenwood Avenue, Chicago, Ill.
ALDIS, ARTHUR T., 247 Monadnock Block, Chicago, Ill.
ALLEN, BENJAMIN, 10 South Wabash Avenue, Chicago, Ill.
ARMOUR, M. C., 1515 Corn Exchange Bank Building, Chicago, Ill.
ARMOUR, MRS. P. D., 2115 Prairie Avenue, Chicago, Ill.
BABCOCK, DR. ROBERT H., 44 Bellevue Place, Chicago, Ill.
BAILEY, EDWARD P., 2400 South Park Avenue, Chicago, Ill.
BARAT, DR. STEPHEN S., 9154 Commercial Avenue, Chicago, Ill.
BARTLETT, A. C., State Street Bridge, Chicago, Ill.
BARTLETT, MRS. FREDERIC C., 2901 Prairie Avenue, Chicago, Ill.
BECK, DR. EMIL G., 173 Lake View Avenue, Chicago, Ill.
BEIDLER, FRANCIS, 20 Weat Jackson Boulevard, Chicago, Ill.
BEVAN, DR. ARTHUR DEAN, 32 North State Street, Chicago, Ill.
BILLINGS, DR. FRANK, 122 South Michigan Boulevard, Chicago, Ill.
BLACKWOOD, DR. A. L., 22 East Washington Street, Chicago, Ill.
BLAINE, MRS. EMMONS, 101 East Erie Street, Chicago, Ill.
BLAIR, WATSON F., 720 Rush Street, Chicago, Ill.
BORLAND, MRS. JOHN JAY, 2616 Prairie Avenue, Chicago, Ill.
BRITTON, DR. JAMES A., 122 South Michigan Boulevard, Chicago, Ill.
BUTLER, EDWARD B., 3408 Michigan Avenue, Chicago, Ill.

Caldwell, Dr. C. P. 4429 Michigan Avenue, Chicago, Ill.
Capps, Dr. Joseph A., 32 North State Street, Chicago, Ill.
Caruthers, Mrs. Malcolm, 44 Banks Street, Chicago, Ill.
Casselberry, Dr. W. E., 15 East Washington Street, Chicago, Ill.
Chancellor, Dr. Philip S., 559 Surf Street, Chicago, Ill.
Chatfield-Taylor, H. C., 631 Rush Street, Chicago, Ill.
Churchill, Dr. Frank Spooner, 1259 North State Street, Chicago, Ill.
Cobb, Joseph Pettee, 1021 East 47th Street, Chicago, Ill.
Conover, Charles H., 152 North State Street, Chicago, Ill.
Cowles, Alfred, Postal Telegraph Building, Chicago, Ill.
Crowder, Dr. T. R., Pullman Building, Chicago, Ill.
Crowell, H. P., Quaker Oats Company, 1600 Railway Exchange, Chicago, Ill.
Davis, Dr. N. S., Jr., 7 West Madison Street, Chicago, Ill.
Deering, James, 1430 Lake Shore Drive, Chicago, Ill.
Donnelley, Thomas E., 731 Plymouth Court, Chicago, Ill.
Eisendrath, Dr. Daniel N., 4840 Woodlawn Avenue, Chicago, Ill.
Evans, Dr. W. A., 31 North State Street, Chicago, Ill.
Favill, Dr. Henry B., 32 North State Street, Chicago, Ill.
Ferguson, J. J., Swift and Company, Chicago, Ill.
Field, James A., University of Chicago, Chicago, Ill.
Foley, Miss Edna L., 104 South Dearborn Street, Chicago, Ill.
Frankenthal, Dr. Lester E., 4825 Woodlawn Avenue, Chicago, Ill.
Fulmer, Miss Harriet, Visiting Nurse Association of Chicago, 5329 Lake Avenue, Chicago, Ill.
Fütterer, Dr. Gustav, 15 East Washington Street, Chicago, Ill.
Goodrich, Albert W., 1474 Michigan Avenue, Chicago, Ill.
Gray, Dr. Ethan A., 2744 Pine Grove Avenue, Chicago, Ill.
Hamill, Charles H., 105 West Monroe Street, Chicago, Ill.
Hamilton, Miss Alice, Hull House, Chicago, Ill.
Hektoen, Dr. Ludvig, Memorial Institute for Infectious Diseases, 1743 W. Harrison Street, Chicago, Ill.
Houghteling, James L., 181 La Salle Street, Chicago, Ill.
Ingals, Dr. E. Fletcher, 15 East Washington Street, Chicago, Ill.
Isham, Dr. George S., 1340 North State Street, Chicago, Ill.
Johnson, Dr. Frank S., 2521 Prairie Avenue, Chicago, Ill.
Jordan, Edwin O., University of Chicago, Chicago, Ill.
Keith, Mrs. Edson, 1906 Prairie Avenue, Chicago, Ill.
Lathrop, Bryan, 37 West Van Buren Street, Chicago, Ill.
Lathrop, Mrs. Bryan, 120 Bellevue Place, Chicago, Ill.
Lawrence, Dwight, First National Bank Building, Chicago, Ill.
Lee, Blewett, 5559 Washington Avenue, Chicago, Ill.
McConnell, Charles H., 4417 Ellis Avenue, Chicago, Ill.
McCormick, Cyrus H., 50 East Huron Street, Chicago, Ill.
McCormick, Harold, 1000 Lake Shore Drive, Chicago, Ill.
McCormick, Mrs. Harold, 1000 Lake Shore Drive, Chicago, Ill.
McCrea, Willis S., 157 Michigan Avenue, Chicago, Ill.
McMichael, Dr. O. W., 4 West Ontario Street, Chicago, Ill.
May, Francis E., 3344 Michigan Avenue, Chicago, Ill.
Minnick, James, Superintendent, Chicago Tuberculosis Institute, 1351 Otis Building, Chicago, Ill.
Morgan, Dr. William E., 3256 Indiana Avenue, Chicago, Ill.
Mulliken, Alfred H., 725 Marquette Building, Chicago, Ill.
Murphy, Dr. John B., 32 North State Street, Chicago, Ill.
Nolan, John H., 331 Insurance Exchange, 175 West Jackson Boulevard, Chicago, Ill.
Ochsner, Dr. Albert J., 2106 Sedgwick Street, Chicago, Ill.
Ochsner, Dr. Edward H., 2038 Lane Place, Chicago, Ill.
Piper, C. E., Supreme Scribe, Royal League, Chicago, Ill.
Ritter, Dr. John, 32 North State Street, Chicago, Ill.

ROBISON, DR. JOHN A., 706 Kenesaw Terrace, Chicago, Ill.
ROONEY, THOMAS E., Tribune Building, Chicago, Ill.
ROSENWALD, JULIUS, care of Sears, Roebuck & Company, Chicago, Ill.
RUMSEY, GEORGE D., 62 East Division Street, Chicago, Ill.
SACHS, DR. THEODORE B., 32 North State Street, Chicago, Ill.
SACHS, MRS. THEODORE B., 1306 Independence Boulevard, Chicago, Ill.
SHAMBAUGH, DR. GEORGE E., 32 North State Street, Chicago, Ill.
SIMMONS, DR. GEORGE H., 535 Dearborn Avenue, Chicago, Ill.
SMITH, MISS MARY R., 12 West Walton Place, Chicago, Ill.
SPALDING, MRS. KEITH, 2626 Prairie Avenue, Chicago, Ill.
SPRAGUE, A. A., 2d, Michigan Avenue and Randolph Street, Chicago, Ill.
STEVENSON, DR. ALEXANDER F., 122 South Michigan Avenue, Chicago, Ill.
STRAWSON, ARTHUR J., 1351 Otis Building, Chicago, Ill.
TICE, DR. FREDERICK, 31 North State Street, Chicago, Ill.
WEBSTER, DR. GEORGE W., 32 North State Street, Chicago, Ill.
WING, FRANK E., 105 West Monroe Street, Chicago, Ill.

BROWN, DR. EVERETT, Milliken Bank Building, Decatur, Ill.
BROWN, DR. SANGER, Kenilworth, Ill.
CHRISTIE, R. J., Quincy, Ill.
DAVIS, DR. FRANKLIN S., 712 Hamilton Boulevard, Peoria, Ill.
EMORY, B. C., Secretary, Peoria Association for the Prevention of Tuberculosis, 404 City Hall, Peoria, Ill.
FITZ-HUGH, MRS. CARTER, Lake Forest, Ill.
GRAVES, WILLIAM C., Illinois State Board of Charities, Springfield, Ill.
HAWES, CHARLES W., Head Clerk, Modern Woodmen of America, Rock Island, Ill.
HOUGHTELING, MISS HARRIET, Winnetka, Ill.
JAMES, PHILIP L., Box 108, Lake Forest, Ill.
KREIDER, DR. GEORGE NOBLE, 522 Capitol Avenue, Springfield, Ill.
MILLER, DR. S. M., Peoria, Ill.
MILLIGAN, DR. JOSEPHINE, 610 West State Street, Jacksonville, Ill.
MYERS, DR. WILLIS A., Wenona, Ill.
OAKFORD, A. S., 304 South Washington Street, Peoria, Ill.
PETTIT, DR. J. W., Ottawa, Ill.
PETTIT, DR. ROSWELL T., Ottawa, Ill.
RICH, DR. FRANK D., Joliet, Ill.
ROBERTS, DR. THOMAS ELMER, 132 North Oak Park Avenue, Oak Park, Ill.
SALA, DR. E. M., 1829 Fourth Avenue, Rock Island, Ill.
SMITH, DR. A. E., 129 Stephenson Street, Freeport, Ill.
SOPER, CLINTON P., Bloomington, Ill.
TAPHORN, DR. GERHARD, 203 East 2d Street, Alton, Ill.
VAWTER, WILLIAM A., 214 Greenwood Boulevard, Evanston, Ill.
WARD, DR. TODD P., Mount Vernon, Ill.
WESSEL, DR. P. H., Moline, Ill.

INDIANA

BEASLEY, DR. T. J., Rockwood Tuberculosis Sanatorium, Danville, Ind.
BURRAGE, DR. SEVERANCE, Care of Eli Lilly & Co., Indianapolis, Ind.
BUTLER, AMOS W., 52 State House, Indianapolis, Ind.
CARTER, DR. AMOS, Plainfield, Ind.
COWING, DR. HUGH A., Muncie, Ind.
DOLLENS, DR. T. C., Trinity Springs, Ind.
EBEL, CHARLES W., 515 Kossuth Street, Lafayette, Ind.
FAIRBANKS, HON. CHARLES W., 1522 North Meridan Street, Indianapolis, Ind.
HARTLOFF, DR. CHARLES W., 120 Upper 3d Street, Evansville, Ind.
HESSLER, DR. ROBERT, Logansport, Ind.
HOLDER, DR. R. E., Columbus, Ind.
HOWAT, DR. W. F., 151 South Hokman Street, Hammond, Ind.
HURTY, DR. J. N., State Board of Health, Indianapolis, Ind.

KINSEY, MRS. O. P., 252 Greenwich Street, Valparaiso, Ind.
LEAVITT, DR. H. B., Indiana State Tuberculosis Hospital, Rockville, Ind.
LITTLE, DR. J. A., Logansport, Ind.
LYNCH, JAMES M., President International Typographical Union, 635 Newton Claypool Building, Indianapolis, Ind.
MCCOY, DR. GEORGE T., 1127 Pearl Street, Columbus, Ind.
MILLER, HUGH T., Columbus, Ind.
NEIER, DR. OLIVER C., 5402 East Washington Street, Indianapolis, Ind.
NIVEN, DR. A. B., Fort Wayne, Ind.
POTTER, DR. THEODORE, 212 Newton Claypool Building, Indianapolis, Ind.
SENSENICH, DR. ROSCOE L., J. M. S. Building, South Bend, Ind.
TUCKER, DR. FREDERICK A., Noblesville, Ind.
WOOLLEN, H. M., American Central Life Insurance Company, Indianapolis, Ind.
WYNN, DR. FRANK B., 311 Newton Claypool Building, Indianapolis, Ind.

IOWA

BLOCKLINGER, DR. A. H., 11th and Iowa Streets, Dubuque, Iowa
CARHART, DR. WILLIAM G., Marion, Iowa
GIBSON, J. I., State House, Des Moines, Iowa
JUNGBLUT, DR. H. C., Tripoli, Bremer County, Iowa
KEPFORD, A. E., State Board of Control, Des Moines, Iowa
MCILRAIN, MRS. M. P., 1604 Dill Street, Burlington, Iowa
MACRAE, DR. DONALD, JR., Council Bluffs, Iowa
NORTON, W. H., Mt. Vernon, Iowa
RYAN, DR. GRANVILLE, Citizens Bank Building, Des Moines, Iowa
SCARBOROUGH, DR. H. V., Iowa Tuberculosis Sanatorium, Oakdale, Iowa
STANGE, CHARLES H., Ames, Iowa
VAN EPPS, C., Iowa City, Iowa
VOLDENG, DR. MATHEW NELSON, Cherokee, Iowa
WILL, FREDERICK J., 513 Equitable Building, Des Moines, Iowa

KANSAS

COBURN, DR. CLAY E., Portsmouth Building, Kansas City, Kan.
CRUMBINE, DR. S. J., State Board of Health, Topeka, Kan.
DORSEY, DR. J. G., 105 West Douglas Avenue, Wichita, Kan.
EMLEY, DR. S. C., Lawrence, Kan.
EVERHARDY, DR. J. L., Leavenworth, Kan.
MENNINGER, DR. C. F., Topeka, Kan.
MURPHY, EDWARD E., Director Modern Woodmen of America, Leavenworth, Kan.

KENTUCKY

ADLER, CYRUS L., 29th and Chestnut Streets, Louisville, Ky.
AHRENS, THEO., 327 West Main Street, Louisville, Ky.
BRECKENRIDGE, MRS. DESHA, 337 Linden Walk, Lexington, Ky.
CAMDEN, MISS TEVIS, Versailles, Ky.
COFFMAN, DR. W. H., Georgetown, Ky.
COWLEY, DR. ROBERT HENRY, Berea College, Berea, Ky.
FLEXNER, BERNARD, Paul Jones Building, Louisville, Ky.
FLEXNER, DR. J. A., 1044 Second Street, Louisville, Ky.
HAYS, MRS. JAMES D., Owensboro, Ky.
HILLIARD, BYRON, 138 South 5th Street, Louisville, Ky.
JACKSON, MISS CHLOE, 618 West Main Street, Lexington, Ky.
KLEIN, ALEX. H., President, The Kenton County Anti-Tuberculosis League, 1014 Russell Street, Covington, Ky.
NONES, W. C., Kentucky Wagon Manufacturing Company, Louisville, Ky.
PENNINGTON, DR. M., Bertha, Ky.
ROBERTS, DR. HARVEY H., 218 North Broadway, Lexington, Ky.

Sampson, F. A., 121 West Chestnut Street, Louisville, Ky.
Sights, Dr. H. Preston, Paducah, Ky.
Sprague, Dr. George P., Lexington, Ky.
Stucky, Dr. J. A., Lexington, Ky.
White, Dr. William C., Second and Chestnut Streets, Louisville, Ky.
Wilson, Dr. Dunning S., 972 South Brook Street, Louisville, Ky.

LOUISIANA

Bel, Dr. George S., 1204 Napoleon Avenue, New Orleans, La.
Chaillé, Dr. S. E., 1551 Canal Street, New Orleans, La.
Dalrymple, Dr. W. H., Louisiana State University, Baton Rouge, La.
Durel, Dr. Wallace J., 408 Medical Building, New Orleans, La.
Edgerton, Dr. E. Otis, Arcadia, La.
Elliott, Dr. John B., Jr., 1423 Louisiana Avenue, New Orleans, La.
Matas, Dr. Rudolph, 2255 St. Charles Avenue, New Orleans, La.
Weil, Dr. A. I., Secretary, Louisiana Anti-Tuberculosis League, 1309 Tulane Avenue, New Orleans, La.
Weis, Joseph D., 1448 Jackson Avenue, New Orleans, La.

MAINE

Bennet, E. H., Lubec, Me.
Beyer, Henry G., Jr., 120 Exchange Street, Portland, Me.
Dobson, Dr. Lindley, Ashland, Me.
Downs, Dr. A. A., Fairfield, Me.
Garrison, Dr. William Miles, Maine State Sanatorium, Hebron, Me.
Gerrish, Dr. Frederic Henry, 675 Congress Street, Portland, Me.
Hills, Dr. Frederick L., Box 603, Bangor, Me.
Kimball, Dr. Irving E., 717 Congress Street, Portland, Me.
Nichols, Dr. Estes, Maine Sanatorium, Hebron, Me.
Northcott, Dr. Edwin M., Union Mutual Life Insurance Company, Portland, Me.
Parmalee, Dr. Walter W., 347 Turner Street, Auburn, Me.
Payson, C. H., 32 Exchange Street, Portland, Me.
Potter, Dr. H. T., Calais, Me.
Webber, Dr. Stephen E., Calais, Me.
Welch, Dr. Francis J., 698 Congress Street, Portland, Me.

MARYLAND

Baltimore (For remainder of State see below.)

Ames, Joseph S., 225 West Preston Street, Baltimore, Md.
Barker, Dr. Lewellys F., 1035 North Calvert Street, Baltimore, Md.
Bloede, Victor G., Station D., Baltimore, Md.
Bloodgood, Dr. Joseph C., 904 North Charles Street, Baltimore, Md.
Bonaparte, Charles J., 216 St. Paul Street, Baltimore, Md.
Bosley, Dr. James, The Severn, Baltimore, Md.
Brack, Dr. Charles Emil, 500 East 20th Street, Baltimore, Md.
Buckler, Dr. H. Warren, 806 Cathedral Street, Baltimore, Md.
Buckler, W. H., Hotel Belvedere, Baltimore, Md.
Carroll, David H., Continental Trust Building, Baltimore, Md.
Cary, John R., Provident Savings Bank, Baltimore, Md.
Cone, Dr. Claribel, The Marlborough, 1701 Eutaw Place, Baltimore, Md.
Cook, Mrs. George H., 1001 St. Paul Street, Baltimore, Md.
Dabney, Dr. William M., Union Protestant Infirmary, Baltimore, Md.
Epstein, Jacob, 2532 Eutaw Place, Baltimore, Md.
Finney, Dr. J. M. F., 1300 Eutaw Place, Baltimore, Md.
Follis, Dr. Richard H., 3 East Read Street, Baltimore, Md.
Fulton, Dr. John S., 2211 St. Paul Street, Baltimore, Md.

Futcher, Dr. Thomas B., 3 West Franklin Street, Baltimore, Md.
Garrett, Robert, 506 Continental Trust Building, Baltimore, Md.
Gelien, Dr. J., care of Phipps Dispensary, Johns Hopkins Hospital, Baltimore, Md.
Gichner, Dr. Joseph E., 1516 Madison Avenue, Baltimore, Md.
Gilman, Miss Elizabeth, 513 Park Avenue, Baltimore, Md.
Goodpasture, Ernest William, 519 North Wolfe Street, Baltimore, Md.
Halsted, Dr. W. S., 1201 Eutaw Place, Baltimore, Md.
Hamburger, Dr. Louis P., 1207 Eutaw Place, Baltimore, Md.
Hamman, Dr. Louis V., 21 West Franklin Street, Baltimore, Md.
Hirschfelder, Dr. Arthur D., The Monterey, Baltimore, Md.
Hollyday, Lamar, Bay View Asylum, Station J, Baltimore, Md.
Hoopper, Robert L., 1208 Fidelity Building, Baltimore, Md.
Hunner, Dr. Guy L., 2305 St. Paul Street, Baltimore, Md.
Hutzler, David, 212 North Howard Street, Baltimore, Md.
Jacobs, Dr. Henry Barton, 11 Mt. Vernon Place, W., Baltimore, Md.
Key, Charles E., 1722 Hollins Street, Baltimore, Md.
Keyser, P. Brent, Keyser Building, Baltimore, Md.
Knox, Dr. J. H. Mason, 804 Cathedral Street, Baltimore, Md.
Koehler, Fred C., 1837 East Fayette Street, Baltimore, Md.
Kriel, Mrs. Charles G., 3042 St. Paul Street, Baltimore, Md.
LaMotte, Miss Ellen N., 1123 Madison Avenue, Baltimore, Md.
Lent, Miss Mary E., 1123 Madison Avenue, Baltimore, Md.
Leopold, Dr. Eugene J., 803 Park Avenue, Baltimore, Md.
Likes, Dr. Sylvan H., 1134 Linden Avenue, Baltimore, Md.
Marburg, Theodore, 14 West Mt. Vernon Place, Baltimore, Md.
Moss, Dr. William Lorenzo, Johns Hopkins Hospital, Baltimore, Md.
Newcomer, Waldo, National Exchange Bank, Baltimore, Md.
Norton, Dr. Rupert, Johns Hopkins Hospital, Baltimore, Md.
O'Neill, Dr. John E., 2508 North Charles Street, Baltimore, Md.
Penrose, Dr. Clement Andariese, 21 West Mt. Royal Avenue, Baltimore, Md.
Pirquet, Dr. Clemens F. v., 118 West Franklin Street, Baltimore, Md.
Pleasants, Dr. J. Hall, 16 West Chase Street, Baltimore, Md.
Price, Dr. Marshall L., 10 South Street, Baltimore, Md.
Robinson, Dr. Harry M., 2010 Wilkens Avenue, Baltimore, Md.
Rose, Douglas H., 6 South Street, Baltimore, Md.
Singewald, Dr. Albert G., 1503 East North Avenue, Baltimore, Md.
Steele, H. Wirt, 15 East Pleasant Street, Baltimore, Md.
Thayer, Dr. W. S., 406 Cathedral Street, Baltimore, Md.
Thom, De Courcy W., 405 Maryland Trust Building, Baltimore, Md.
Thomas, Mrs. H. M., 1228 Madison Avenue, Baltimore, Md.
Todd, Dr. William J., Mt. Washington P. O., Baltimore, Md.
Voshell, Jonathan K., 125 East Baltimore Street, Baltimore, Md.
Webb, Mrs. George R., Garrison and Belle Avenues, Baltimore, Md.
Welch, Dr. William H., 807 St. Paul Street, Baltimore, Md.
White, Richard J., 10 South Street, Baltimore, Md.
Wilson, Dr. Gordon, 1318 North Charles Street, Baltimore, Md.
Wolman, Dr. Samuel, 2101 Brookfield Avenue, Baltimore, Md.
Young, Dr. Hugh H., Johns Hopkins University, Baltimore, Md.

Broderick, D. I., Catonsville, Md.
Cochran, Mrs. B. W., Jr., 200 Goodwood Garden, Roland Park, Md.
Cullen, Dr. Victor F., Maryland Tuberculosis Sanatorium, State Sanatorium, Md.
Gordon, G. E., Chevy Chase, Md.
Kefauver, Dr. E. C., Thurmont, Md.
Langford, Archibald, St. James School, Washington Co., Md.
Lassen, Miss M. L., State Sanatorium, Md.
Mayhew, Dr. Walter H., State Sanatorium, Md.
Nies, Miss Mary L., Frederick City Hospital, Frederick, Md.

PEARSON, H. H., JR., Rich Neck Manor, Claiborne, Md.
SCHROEDER, E. C., U. S. Experiment Station, Bethesda, Md.
SHOEMAKER, S. M., Eccleston, Md.
SHRIVER, HENRY, 77 Washington Street, Cumberland, Md.
SLOAN, DR. MARTIN F., Eudowood Sanatorium, Towson, Md.

MASSACHUSETTS

Boston (For remainder of State see below.)

ARMS, DR. B. L. 739 Boylston Street, Boston, Mass.
ARNOLD, DR. H. D., 427 Beacon Street, Boston, Mass.
BAILEY, DR. WALTER C., 269 Beacon Street, Boston, Mass.
BOUTWELL, DR. HORACE KEITH, 416 Marlborough Street, Boston, Mass.
BOWDITCH, ALFRED, 75 Bay State Road, Boston, Mass.
BOWDITCH, MRS. ALFRED, 75 Bay State Road, Boston, Mass.
BOWDITCH, CHARLES P., 28 State Street, Boston, Mass.
BOWDITCH, DR. HENRY I., 416 Marlborough Street, Boston, Mass.
BOWDITCH, DR. VINCENT Y., 506 Beacon Street, Boston, Mass.
BRACKETT, DR. JEFFREY R., 9 Hamilton Place, Boston, Mass.
BRADFORD, DR. E. H., 133 Newbury Street, Boston, Mass.
BRADLEY, MISS LUCY W., Boston Dispensary, 25 Bennet Street, Boston, Mass.
BROOKS, MRS. PETER C., 2 Deerfield Street, Boston, Mass.
CABOT, DR. ARTHUR T., 1 Marlborough Street, Boston, Mass.
CABOT, DR. RICHARD, 190 Marlborough Street, Boston, Mass.
CANNON, MISS IDA M., Social Service Department, Massachusetts General Hospital, Boston, Mass.
CHENEY, MRS. B. P., 32 Marlborough Street, Boston, Mass.
CLAPP, DR. H. C., 419 Boylston Street, Boston, Mass.
CLARK, B. PRESTON, P. O. Box 2682, Boston, Mass.
CLARK, MRS. B. PRESTON, P. O. Box 2682, Boston, Mass.
COCHRANE, ALEXANDER, P. O. Box 160, Boston, Mass.
COLLAMORE, MISS HELEN, 317 Commonwealth Avenue, Boston, Mass.
COOLIDGE, MRS. J. RANDOLPH, 130 Beacon Street, Boston, Mass.
COX, DR. SIMON F., Boston Consumptives Hospital, Boston, Mass.
CURTIS, MRS. CHARLES P., 20 Commonwealth Avenue, Boston, Mass.
DONALD, MRS. W. A., 173 Marlborough Street, Boston, Mass.
ERNST, DR. HAROLD C., Harvard Medical School, Boston, Mass.
FABYAN, MARSHALL, 381 Commonwealth Avenue, Boston, Mass.
FITZ, DR. REGINALD H., 18 Arlington Street, Boston, Mass.
FORBES, DR. HENRY S., 614 Sears Building, Boston, Mass.
FORBES, J. MURRAY, 107 Commonwealth Avenue, Boston, Mass.
FULLER, DR. DANIEL H., 6 Walnut Street, Boston, Mass.
GOLDTHWAIT, DR. JOEL E., 372 Marlborough Street, Boston, Mass.
HAMLER, MISS ELIZABETH, 130 Marlborough Street, Boston, Mass.
HAWES, DR. JOHN B., 2D, 295 Beacon Street, Boston, Mass.
HEMENWAY, AUGUSTUS, 10 Tremont Street, Boston, Mass.
HIGGINSON, HENRY L., 44 State Street, Boston, Mass.
HOUGHTON, CLEMENT S., 60 State Street, Boston, Mass.
HOUGHTON, MISS ELIZABETH G., 191 Commonwealth Avenue, Boston, Mass.
HOUGHTON, DR. HENRY L., 419 Boylston Street, Boston, Mass.
HOUGHTON, DR. R. H., 308 Sumner Street, East Boston, Mass.
HYAMS, G. M., 309 Sears Building, Boston, Mass.
JACKSON, DR. HENRY, 380 Marlborough Street, Boston, Mass.
JOHNSON, DR. F. W., 167 Newbury Street, Boston, Mass.
JONES, ALFRED, The Wadsworth, Kenmore and Newbury Streets, Boston, Mass.
JOSLIN, DR. ELLIOTT P., 81 Bay State Road, Boston, Mass.
LEE, JOSEPH, 101 Tremont Street, Boston, Mass.
LEE, DR. ROGER I., 99 Commonwealth Avenue, Boston, Mass.

Locke, Dr. Edwin A., 311 Beacon Street, Boston, Mass.
Lord, Dr. F. T., 305 Beacon Street, Boston, Mass.
Loring, Mrs. William Caleb, 2 Gloucester Street, Boston, Mass.
McSweeney, Edward F., 926 Tremont Building, Boston, Mass.
Mason, Miss E. F., 1 Walnut Street, Boston, Mass.
Mason, Miss Ida, 1 Walnut Street, Boston, Mass.
Means, James Howard, 196 Beacon Street, Boston, Mass.
Minot, Dr. James J., 188 Marlborough Street, Boston, Mass.
Morse, Dr. John Lovett, 70 Bay State Road, Boston, Mass.
Mosher, Dr. Harris P., 828 Beacon Street, Boston, Mass.
Murphy, Dr. Timothy J., 372 Dudley Street, Boston, Mass.
Otis, Dr. Edward O., 381 Beacon Street, Boston, Mass.
Page, Dr. Calvin Gates, 128 Marlborough Street, Boston, Mass.
Parker, William Lincoln, 312 Dartmouth Street, Boston, Mass.
Parks, F. R., Secretary, Loyal Protective Insurance Company, 585 Boylston Street, Boston, Mass.
Pratt, Dr. Joseph H., 317 Marlborough Street, Boston, Mass.
Putnam, Dr. Charles P., 63 Marlborough Street, Boston, Mass.
Richardson, Dr. Maurice H., 224 Beacon Street, Boston, Mass.
Rotch, Dr. Thomas Morgan, 197 Commonwealth Avenue, Boston, Mass.
Russell, Mrs. H. S., 191 Commonwealth Avenue, Boston, Mass.
Russell, Mrs. Robert S., 20 Commonwealth Avenue, Boston, Mass.
Saltonstall, Richard D., 99 Bay State Road, Boston, Mass.
Saltonstall, Mrs. Richard D., 99 Bay State Road, Boston, Mass.
Sargent, Winthrop, 207 Commonwealth Avenue, Boston, Mass.
Sargent, Mrs. Winthrop, 207 Commonwealth Avenue, Boston, Mass.
Sears, Dr. George G., 426 Beacon Street, Boston, Mass.
Shattuck, Dr. F. C., 135 Marlborough Street, Boston, Mass.
Shattuck, Dr. George B., 183 Beacon Street, Boston, Mass.
Shattuck, George C., 227 Beacon Street, Boston, Mass.
Shaw, Francis, 190 Beacon Street, Boston, Mass.
Shea, Dr. Thomas B., Old Court House, Boston, Mass.
Silsbee, Arthur B., 28 State Street, Boston, Mass.
Slocum, Miss Laura, Pond Street, Jamaica Plain, Boston, Mass.
Smith, Jeremiah, Jr., 84 State Street, Boston, Mass.
Smith, Professor Theobald, Harvard Medical School, Boston, Mass.
Southard, Louis C., Tremont Building, Boston, Mass.
Stone, Dr. Arthur K., 44 Fairfield Street, Boston, Mass.
Stone, Nathaniel H., 614 Sears Building, Boston, Mass.
Stone, Seymour H., Executive Secretary, Boston Association for the Relief and Control of Tuberculosis, 4 Joy Street, Boston, Mass.
Sturgis, Francis S., 149 Newbury Street, Boston, Mass.
Tyson, Russell, 60 State Street, Boston, Mass.
Van Da Linda, Frank, 67 Kingston Street, Boston, Mass.
Van Nostrand, A. G., 482 Beacon Street, Boston, Mass.
Warren, Professor J. Collins, 58 Beacon Street, Boston, Mass.
White, Dr. James C., 259 Marlborough Street, Boston, Mass.
Williams, Dr. Francis H., 505 Beacon Street, Boston, Mass.
Williams, Dr. Harold, 528 Beacon Street, Boston, Mass.
Winsor, Robert, Boston, Mass.
Yardley, Miss M. A., 506 Beacon Street, Boston, Mass.

Adams, Dr. J. F. A., Pittsfield, Mass.
Bartlett, Halleck, 340 Main Street, Worcester, Mass.
Bartlett, Dr. P. Challis, Rutland State Sanatorium, Rutland, Mass.
Beckley, Dr. C. C., Lancaster, Mass.
Bill, Nathan D., Springfield, Mass.
Bowditch, Mrs. E. Francis, Framingham, Mass.

Bowditch, Miss Elizabeth F., Framingham, Mass.
Bowditch, John P., Framingham, Mass.
Bowditch, Miss Olivia Y., 107 Randolph Avenue, Milton, Mass.
Bradley, R. M., 36 Brown Street, Brookline, Mass.
Brown, Dr. Wilfrid G., Plymouth, Mass.
Burns, Dr. Newell Bly, North Reading State Sanatorium, North Wilmington, Mass.
Chadwick, Dr. Henry D., Westfield State Sanatorium, Westfield, Mass.
Chase, Miss Alice P., 47 Baltimore Street, Lynn, Mass.
Childs, Mrs. Charles E., 81 Henshaw Avenue, Northampton, Mass.
Clark, Dr. Leonard B., 36 Sycamore Street, Waverly, Mass.
Coolidge, Dr. Frederic S., Upway Field, Pittsfield, Mass.
Coolidge, Dr. Sumner, Lakeville State Sanatorium, Middleboro, Mass.
Crane, Dr. Bayard T., Crane Sanatorium, Rutland, Mass.
Dabney, Mrs. Harriet W., 272 Adams Street, Milton, Mass.
Darling, Dr. Eugene A., 138 Brattle Street, Cambridge, Mass.
Ellis, Dr. Fred W., Monson, Mass.
Emerson, Dr. Ernest B., State Farm Hospital, Bridgewater, Mass.
Fisher, Miss Emily Curtis, 345 Neponset Street, Norwood, Mass.
Fisk, Dr. Samuel A., Brimfield, Mass.
Flanders, Miss Miriam N., Ditson Place, Methuen, Mass.
Floyd, Dr. Cleaveland, 1398 Beacon Street, Brookline, Mass.
Forbes, Mrs. J. Malcolm, Milton, Mass.
Gage, Dr. Homer, 72 Pearl Street, Worcester, Mass.
Gay, Mrs. Josephine S., Brookline, Mass.
Gifford, Dr. John H., 320 Rock Street, Fall River, Mass.
Glidden, Dr. E. W., Jr., Lakeville State Sanatorium, Middleboro, Mass.
Goodwin, Dr. James J., 202 Church Street, Clinton, Mass.
Gordon, Mrs. Clarence E., Amherst, Mass.
Granger, Dr. F. C., Randolph, Mass.
Griffin, Dr. Walter A., Sharon Sanatorium, Sharon, Mass.
Hemenway, Mrs. Augustus, Readville, Mass.
Heywood, Miss Alice W., 61 Central Street, Gardner, Mass.
Howard, John R., Jr., East Northfield, Mass.
Howe, Dr. George P., 159 Haverhill Street, Lawrence, Mass.
Hyams, Miss Isabel F., 26 Wales Street, Dorchester, Mass.
Jack, Dr. Ernest S., 6 West Emerson Street, Melrose, Mass.
Jaques, Dr. Henry P., Lenox, Mass.
Lapham, Dr. George N., Massachusetts State Sanatorium, Rutland, Mass.
Lewis, Miss Ora Mabelle, South Lancaster, Mass.
Little, Capt. William Nelson, care of Fore River Shipbuilding Company, Quincy, Mass.
Loring, Miss Louisa P., Burn Side, Prides Crossing, Mass.
Lyman, Mrs. Theodore, Brookline, Mass.
Lyon, Dr. James A., Rutland State Sanatorium, Rutland, Mass.
MacCorison, Dr. Carl C., North Reading State Sanatorium, North Wilmington, Mass.
McDermott, Dr. William V., Secretary, Committee for the Prevention of Tuberculosis, 10 Washington Square, West, Salem, Mass.
Mendelsohn, Louis, 477 Washington Street, Dorchester, Mass.
Ober, Dr. Ralph B., President, Springfield Association for the Prevention of Tuberculosis, 613½ Main Street, Springfield, Mass.
Packard, Dr. Mary S., R. F. D. 2, Rehoboth, Mass.
Peabody, Harold, Brush Hill Road, Hyde Park, Mass.
Paulding, Mrs. Charles P., Milton, Mass.
Peirce, Arthur W., Dean Academy, Franklin, Mass.
Percy, Professor Frederick B., 194 Aspenwall Avenue, Brookline, Mass.
Phippen, Dr. Hardy, 78 Washington Square, Salem, Mass.
Pitta, Dr. John, 11 Allen Street, New Bedford, Mass.
Prescott, Miss Mary R., 401 County Street, New Bedford, Mass.

Rand, Dr. John Prentice, 5 Benefit Street, Worcester, Mass.
Riggs, Dr. Austen Fox, Stockbridge, Mass.
Ripley, Dr. F. J., Brockton, Mass.
Rounseville, Mrs. Frank C., Secretary, The Attleboro Anti-Tuberculosis Society, 137-B South Main Street, Attleboro, Mass.
Sabine, Dr. George K., Brookline, Mass.
Schofield, Mrs. W. H., 101 Brattle Street, Cambridge, Mass.
Scudder, Mrs. Helen R., Nonquitt, Mass.
Smith, Mrs. Mabel Greeley, 689 Massachusetts Avenue, Cambridge, Mass.
Stick, Dr. H. Louis, Box 1178, Worcester, Mass.
Stockpole, Markham W., Andover, Mass.
Swan, Dr. William D., 167 Brattle Street, Cambridge, Mass.
Thayer, John E., Lancaster, Mass.
Thayer, Mrs. John E., Lancaster, Mass.
Tower, Miss Ellen M., Lexington, Mass.
Vietor, Dr. Agnes C., Edgartown, Mass.
Winchester, Dr. J. F., Lawrence, Mass.
Wood, Dr. Albert, State Mutual Insurance Company, Worcester, Mass.
Woodward, Dr. S. B., 58 Pearl Street, Worcester, Mass.
Wright, Mrs. Vernon A., Ox Bow Road, South Lincoln, Mass.

MICHIGAN

Bissell, M. R., Jr., 31 Morris Avenue, Grand Rapids, Mich.
Brenton, Dr. S., 121 W. Alexandrine Avenue, Detroit, Mich.
Denison, Professor Charles S., University of Michigan, Ann Arbor, Mich.
Dickinson, W. W., Hadleigh Hill Farm, St. Joseph, Mich.
Dyar, Miss Clara E., Grosse Point Farms, Detroit, Mich.
Fischer, Dr. Arthur F., Hubbell, Houghton Co., Mich.
Ginsburg, Bernard, 84 Adelaide Street, Detroit, Mich.
Hall, Dr. Freeman, 314 Press Building, Kalamazoo, Mich.
Harkness, Dr. Robert B., Young Building, Houghton, Mich.
Hartz, Dr. Henry Jasper, 27 Adams Avenue, E., Detroit, Mich.
Herman, Raphael, 236 Fort Street, W., Detroit, Mich.
Hewlett, Dr. Albion W., Ann Arbor, Mich.
Houghton, Dr. E. Mark, 130 Longfellow Avenue, Detroit, Mich.
Hudson, J. L., Detroit, Mich.
Jennings, Dr. Charles G., 435 Jefferson Avenue, Detroit, Mich.
Johnston, Dr. Collins H., Grand Rapids, Mich.
Jones, L. H., Ypsilanti, Mich.
Kellogg, Dr. J. H., Battle Creek, Mich.
Kelsey, Professor Francis W., 826 Tappan Street, Ann Arbor, Mich.
Knappen, Hon. Loyal E., Grand Rapids, Mich.
Leenhonts, Dr. A., Holland, Mich.
Leland, Frank B., Detroit United Bank, Detroit, Mich.
LeRoy, Mrs. A. M., Manistique, Mich.
Looker, Oscar R., President, Michigan Mutual Life Insurance Company, Detroit, Mich.
McCormick, Miss Ethel, 23 Park Street, Grand Rapids, Mich.
McGraw, Mrs. William A., care of Union Trust Company, Detroit, Mich.
Nancrede, Dr. C. B. G. de, 504 S. State Street, Ann Arbor, Mich.
Nichols, Miss Lillian I., 317 North Fayette Street, Saginaw, Mich.
Obert, Dr. H. D., Jackson, Mich.
Parker, Dr. Walter R., 912 Chamber of Commerce, Detroit, Mich.
Pierce, Dr. Eugene B., Howell, Mich.
Rich, Dr. Herbert M., 435 Jefferson Avenue, Detroit, Mich.
Sawyer, Walter H., Hillsdale, Mich.
Shankwiler, Dr. R. A., Detroit Tuberculosis Sanatorium, Detroit, Mich.
Shurly, Dr. Burt R., Shurly Building, Detroit, Mich.
Sigler, Dr. C. L. Pinckney, Mich.

VAUGHAN, DR. VICTOR C., Ann Arbor, Mich.
VAUGHAN, DR. V. C., JR., 603 Washington Arcade, Detroit, Mich.
WALTON, MISS CAROL F., Secretary, Michigan Association for the Prevention and Relief of Tuberculosis, Ann Arbor, Mich.
WARTHIN, DR. ALDRED SCOTT, Ann Arbor, Mich.
WILE, DR. UDO J., Ann Arbor, Mich.
ZIWET, PROFESSOR ALEXANDER, University of Michigan, Ann Arbor, Mich.

MINNESOTA

AUNSKE, PERCY S., 523 East Second Street, Duluth, Minn.
BEACH, DR. GEORGE WILLIAM, Minnesota State Sanatorium, State Sanatorium, Cass County, Minn.
BELL, DR. JOHN W., 5127 Harriet Block, Minneapolis, Minn.
BRACKEN, DR. H. M., 1010 Fourth Street, S. E., Minneapolis, Minn.
BRISTOL, DR. LEVERETT DALE, Lowry Building, St. Paul, Minn.
CHRISTIAN, MRS. GEORGE H., 404 South 8th Street, Minneapolis, Minn.
COUNTRYMAN, MISS GRATIA A., Librarian Public Library, Minneapolis, Minn.
CROSBY, MISS CAROLINE M., Unity House, 1616 Washington Avenue, N., Minneapolis, Minn.
DUNSMOOR, DR. F. A., 100 Andrus Building, Minneapolis, Minn.
DUNWOODY, WILLIAM H., Minneapolis, Minn.
EASTON, CHRISTOPHER, Old Capitol, St. Paul, Minn.
GREENE, DR. CHARLES LYMAN, 150 Lowry Arcade, St. Paul, Minn.
HARWOOD, WILLIAM E., Eveleth, Minn.
HENSLIN, A. E., LeRoy, Minn.
HILL, DR. H. W., University of Minnesota, Minneapolis, Minn.
HILL, JAMES J., Great Northern Railway Company, St. Paul, Minn.
HUTTON, MAJOR PAUL C., Fort Snelling, Minn.
JONES, DR. W. A., 513 Pittsburgh Building, Minneapolis, Minn.
LAIRD, DR. ARTHUR T., County of St. Louis Sanatorium Commission, Duluth, Minn.
LIES, EUGENE T., Anti-Tuberculosis Committee, Court House, Minneapolis, Minn.
MCCOLLOM, DR. C. A., 611 Masonic Temple, Minneapolis, Minn.
MCMILLAN, H. S., care of Metal Screen Cottage Company, St. Paul, Minn.
MARCLEY, DR. WALTER J., Nicollet Avenue and Ninth Street, Minneapolis, Minn.
MAYO, DR. C. H., Rochester, Minn.
MORE, DR. CHARLES W., Eveleth, Minn.
NEWMAN, DR. G. A., Prison Hospital, Stillwater, Minn.
OHLINGER, DR. L. B., State Sanatorium, Minn.
ROBERTS, DR. THOMAS S., 1603 Fourth Avenue, S., Minneapolis, Minn.
ROSING, B., 204 West 9th Street, St. Paul, Minn.
SHAW, DR. A. W., Buhl, Minn.
SWENSON, HAROLD, New London, Minn.
TAYLOR, DR. H. LONGSTREET, 810 Lowry Building, St. Paul, Minn.
WESBROOK, PROFESSOR F. F., University of Minnesota, Minneapolis, Minn.
WHITE, DR. S. MARX, 704 Pillsbury Building, Minneapolis, Minn.

MISSISSIPPI

CHAMBERLAIN, DR. JOHN F., Natchez, Miss.
LONGINO, DR. J. T., Jonestown, Miss.
WAGNER, MISS H. C., Locust Hill, Water Valley, Miss.

MISSOURI

BIXBY, W. K., St. Louis, Mo.
BROWN, DR. ORVILLE HARRY, Humboldt Building, St. Louis, Mo.
CRANDALL, DR. GEORGE CLINTON, 3674 Lindell Street, St. Louis, Mo.
DEACON, A. R., care of Lambert Pharmacal Company, 2101 Locust Street, St. Louis, Mo.

Dock, Dr. George, 1806 Locust Street, St. Louis, Mo.
Dorsey, Miss Nancy L., R. N., 2137 South 6th Street, St. Joseph, Mo.
Doyle, Miss Winifred, King Hill Building, St. Joseph, Mo.
English, Dr. Carlos C., Missouri State Sanatorium, Mt. Vernon, Mo.
Fischel, Dr. W. E., Humboldt Building, St. Louis, Mo.
Francis, Hon. David R., 214 North Fourth Street, St. Louis, Mo.
Gebhart, Dr. Oliver C., King Hill Building, St. Joseph, Mo.
Gilmer, Dr. J. E., Piedmont, Mo.
Goltra, Edward F., 4416 Lindell Boulevard, St. Louis, Mo.
Greensfelder, Bernard, 421 Olive Street, St. Louis, Mo.
Hall, Dr. John R., Marshall, Mo.
Homan, Dr. George, Odd Fellows Building, St. Louis, Mo.
Howland, Dr. John, Washington University Medical School, St. Louis, Mo.
Irwin, Dr. Charles B., 803 Rialto Building, Kansas City, Mo.
Mardorf, Dr. W. C., 2136 South Grand Avenue, St. Louis, Mo.
Moore, Mrs. Philip N., 3125 Lafayette Avenue, St. Louis, Mo.
Mudd, Dr. Harvey G., 408 Humboldt Building, St. Louis, Mo.
Murphy, Dr. Franklin E., 1100 Prospect Avenue, Kansas City, Mo.
Porter, Dr. William, 3886 Washington Boulevard, St. Louis, Mo.
Saunders, Dr. E. W., 3003 Lafayette Avenue, St. Louis, Mo.
Smith, Robert R., Director Modern Woodmen of America, Brookfield, Mo.
Stewart, Dr. John, State Sanatorium, Mt. Vernon, Mo.
Tuholske, Dr. Hermann, 465 North Taylor Avenue, St. Louis, Mo.

MONTANA

Allen, Philip C., Great Falls, Mont.
Buchen, Dr. Fritz Ernest, Hamilton, Mont.
Campbell, Dr. Donald, Murray Hospital, Butte, Mont.
Hartman, W. J., Bozeman, Mont.
Longeway, Dr. A. F., Great Falls, Mont.
McCoy, Dr. Columbus E., Belgrade, Mont.
Sievers, Dr. J. R. E., 77 Owsley Block, Butte, Mont.
Sullivan, Dr. J. B., Butte, Mont.
Taylor, Dr. Walter J., Bozeman, Mont.
Tuttle, Dr. T. D., State Board of Health, Helena, Mont.
Walters, Dr. William A., Billings, Mont.
Witherspoon, Dr. T. C., Butte, Mont.

NEBRASKA

Bailey, Dr. Benjamin F., 204 Burr Block, Lincoln, Neb.
Cudahy, E. A., Cudahy Packing Company, South Omaha, Neb.
Edholm, Mrs. K. R. J., 116 South 36th Street, Omaha, Neb.
Hart, Charles K., Prosser, Neb.
Jonas, Dr. A. F., Brandus Building, Omaha, Neb.
Lord, Dr. John Prentiss, 501 Paxton Building, Omaha, Neb.
Neville, M. Keith, North Platte, Neb.
Shaw, Dr. L. M., Osceola, Neb.
Stuff, Miss Lillian B., R. F. D. 8, Lincoln, Neb.
Talbot, Adolphus R., Head Council Modern Woodmen of America, Lincoln, Neb.
Tyndale, Dr. J. H., 217 Richards Block, Lincoln, Neb.
Wattles, G. W., Omaha, Neb.
Ziegler, Dr. Charles H., Vesta, Neb.

NEW HAMPSHIRE

Cheney, Miss Elizabeth, Petersborough, N. H.
Clarke, Dr. George Haven, 102 Pleasant Street, Concord, N. H.
Tibbits, John Knox, Concord, N. H.

UPHAM, DR. SAMUEL R., Claremont, N. H.
WATSON, DR. IRVING A., Concord, N. H.
WISE, DR. JOHN M., New Hampshire State Sanatarium, Warren Summit, N. H.

NEW JERSEY

ALEXANDER, MRS. CAROLINE B., Castle Point, Hoboken, N. J.
ATKINSON, MISS LILY D., Supt., Tuberculosis Hospital of the City of Trenton, Trenton, N. J.
BAUDENDISTEL, V., 729 Polk Street, West New York, N. J.
BORDEN, ALFRED, Short Hills, N. J.
BUERMANN, DR. WILLIAM, 352 Belmont Avenue, Newark, N. J.
BULKLEY, MRS. EDWIN M., Walnut Street, Englewood, N. J.
CADBURY, JOEL, 254 East Main Street, Moorestown, N. J.
CONDICT, DR. A. W., Dover, N. J.
CORWIN, DR. THEODORE W., 146 Second Avenue, Newark, N. J.
DELL, W. A., Morristown, N. J.
DENNIS, DR. L., 49 Ridge Street, Orange, N. J.
DICKINSON, DR. G. K., 280 Montgomery Street, Jersey City, N. J.
DINKLAGE, A., 68 Greenwood Avenue, East Orange, N. J.
DOUGLAS, DR. W. J., Supt. Tuberculosis Department, Essex County Isolation Hospital, Belleville, N. J.
DU BOIS, DR. FRANCIS E., 431 Park Avenue, Plainfield, N. J.
DUNHAM, DR. HENRY B., Glen Gardner, N. J.
EARLE, MRS. E. P., Edgewood Road, Montclair, N. J.
EDWARDS, PIERREPONT, 407 North Broad Street, Elizabeth, N. J.
ENGLISH, DR. SAMUEL B., Sanatorium for Tuberculous Diseases, Glen Gardner, N. J.
FORNACHON, MRS. ELEANOR ASCHENBACH, 40 Clinton Street, Newark, N. J.
FRANCIS, DR. RICHARD P., 16 Plymouth Street, Montclair, N. J.
GRAY, DR. FREDERICK C., 23 West 8th Street, Bayonne, N. J.
HAMILL, DR. ROBERT H., Summit, N. J.
HANCE, DR. IRWIN H., Lakewood, N. J.
HAYDEN, FRANK, 126 Chestnut Street, Rutherford, N. J.
HECHT, DR. JOHN P., 69 Mountain Avenue, Somerville, N. J.
HEDGES, DR. B. VAN D., Plainfield, N. J.
HOFFMAN, FREDERICK L., Prudential Insurance Company, Newark, N. J.
HUBBARD, DR. F. ELMORE, 45 Church Street, Montclair, N. J.
HUGHES, DR. FREDERIC J., Plainfield, N. J.
HURFF, WILLIAM K., Moorestown, N. J.
JARVIE, JAMES N., 150 Upper Mountain Avenue, Montclair, N. J.
JOHNSON, J. WILLIAM, 750 Broad Street, Newark, N. J.
KEATOR, DR. BRUCE S., Asbury Park, N. J.
KELLER, DR. FRANKLIN J., Totowa & Sherman Avenues, Paterson, N. J.
KNOWLTON, DR. MILLARD, 78 North Clinton Avenue, Trenton, N. J.
KRANS, DR. EDWARD S., 920 Park Avenue, Plainfield, N. J.
LANGDON, WOODBURY G., 151 Madison Avenue, Morristown, N. J.
MABIE, MRS. HAMILTON W., Summit, N. J.
MARVEL, DR. PHILIP, 1616 Pacific Avenue, Atlantic City, N. J.
MELLON, MRS. CHARLES H., Madison Avenue, Morristown, N. J.
MERCK, GEORGE, Llewellyn Park, West Orange, N. J.
NEWCOMB, DR. MARCUS W., Brown's-Mills-in-the-Pines, N. J.
OBERT, B. H., Secretary Board of Health, Asbury Park, N. J.
POLLAK, DR. B. S., 2850 Boulevard, Jersey City, N. J.
PYNE, M. TAYLOR, Princeton, N. J.
RANDOLPH, MISS MAY F., 125 34th Street, Woodcliffe-on-Hudson, N. J.
RUNGE, DR. W., 130 Union Street, Newark, N. J.
SCHAUFFLER, DR. WILLIAM G., 400 Madison Avenue, Lakewood, N. J.
SEXSMITH, DR. G. H., 719 Avenue C, Bayonne, N. J.

SMALLWOOD, WILLIAM C., Executive Secretary, New Jersey Association for the Prevention and Relief of Tuberculosis, 164 Market Street, Newark, N. J.
SYMONDS, DR. BRANDRETH, Atlantic Highlands, N. J.
THOMAS, PERCY H., 149 Midland Avenue, Montclair, N. J.
THURLOW, L. R., Plainfield, N. J.
TITSWORTH, CHARLES GRANT, care of Fidelity Trust Company, Newark, N. J.
TODD, R. D., Ridgewood, N. J.

NEW MEXICO

BULLOCK, DR. E. S., Silver City, N. M.
BUSHNELL, COL. G. E., U. S. Army General Hospital, Fort Bayard, N. M.
FRICKS, DR. L. D., P. H. and M.-H. Service, Fort Stanton, N. M.
HAMMER, DR. WILLIAM J., St. Joseph Sanatorium, Silver City, N. M.
HEFLEBOWER, LIEUT. ROY C., U. S. Army General Hospital, Fort Bayard, N. M.
HOLMBERG, LIEUT. CARL E., U. S. Army General Hospital, Fort Bayard, N. M.
HYDE, DR. OLIVER T., St. Joseph's Sanatorium, Silver City, N. M.
LAWS, DR. JAMES W., Lincoln, N. M.
MACLAKE, DR. WILLIAM, Silver City, N. M.
MERA, DR. F. E., Santa Fé, N. M.
PETERS, DR. LEROY S., New Mexico Cottage Sanatorium, Silver City, N. M.
SHORTLE, DR. A. G., Albuquerque Sanatorium, Albuquerque, N. M.
SMITH, DR. FREDERICK C., Fort Stanton, N. M.
TEFFT, CAPT. W. H., U. S. Army General Hospital, Fort Bayard, N. M.

NEW YORK

New York City (For remainder of State see below.)

ABBE, DR. ROBERT, 13 West 50th Street, New York City.
ABBOTT, REV. LYMAN, care of The Outlook, 287 Fourth Avenue, New York City
ADKINS, DR. WILLIAM N., Riverside Hospital Sanatorium, North Brother Island, New York City
ADLER, DR. I., 22 East 62d Street, New York City
ALDRICH, MRS. SHERWOOD, 182 West 58th Street, New York City
ALEXION, DR. ALEXANDER, 153 East 27th Street, New York City
AMERICAN, MISS SADIE, Executive Secretary, Council of Jewish Women, 448 Central Park W., New York City
ARNSTEIN, LEO, 49 East 82d Street, New York City
ARNSTEIN, MRS. LEO, 49 East 82d Street, New York City
ASIEL, ELIAS, 52 Broadway, New York City
ASPINWALL, J. LAWRENCE, 320 Fifth Avenue, New York City
BABBOTT, FRANK L., 346 Broadway, New York City
BACON, DR. GORHAM, 47 West 54th Street, New York City
BAILEY, DR. PEARCE, 52 West 53d Street, New York City
BANGS, DR. L. BOLTON, 32 East 51st Street, New York City
BARD, ALBERT S., 25 Broad Street, New York City
BARROWS, DR. CHARLES CLIFFORD, 63 East 56th Street, New York City
BARUCH, DR. SIMON, 51 West 70th Street, New York City
BEHR, HERMAN, 75 Beekman Street, New York City
BELLER, MRS. A., 9 West 75th Street, New York City
BEND, MISS BEATRICE, 2 East 45th Street, New York City
BENDHEIM, A. D., 42 West 89th Street, New York City
BENDHEIM, HENRY, 134 Grand Street, New York City
BENSON, MISS MARY, 214 Columbia Heights, Brooklyn, N. Y.
BEWLEY, MISS MARGARET A., Presbyterian Hospital, 41 East 70th Street, New York City
BIER, MRS. SYLVAN, 137 Riverside Drive, New York City
BIGGS, DR. HERMANN M., 113 West 57th Street, New York City
BIGGS, MRS. HERMANN M., 113 West 57th Street, New York City
BILLINGS, DR. J. S., JR., 118 W. 57th Street, New York City

BLAKE, DR. JOSEPH A., 601 Madison Avenue, New York City
BLISS, MRS. WILLIAM H., 6 East 65th Street, New York City
BLUMENTHAL, GEORGE, 23 West 53d Street, New York City
BLUMENTHAL, HUGO, 10 West 76th Street, New York City
BOVAIRD, DR. DAVID, JR., 137 East 60th Street, New York City
BRANDT, MISS LILLIAN, 105 East 22d Street, New York City
BRANNAN, DR. JOHN W., 11 West 12th Street, New York City
BREITENFELD, DR. S., 221 East 68th Street, New York City
BREWSTER, GEORGE S., 51 Wall Street, New York City
BRILL, DR. N. E., 48 West 76th Street, New York City
BRISTOL, JOHN I. D., 1 Madison Avenue, New York City
BRONSON, DR. E. B., 10 West 49th Street, New York City
BROWN, ALFRED L., 76 William Street, New York City
BROWN, DR. ANNA L., 125 East 27th Street, New York City
BROWN, EDWIN H., 141 Broadway, New York City
BRUNO, FRANK J., 105 East 22d Street, New York City
BRYANT, DR. JOSEPH D., 48 West 59th Street, New York City
BUDINGTON, DR. W. I., Riverside Hospital, North Brother Island, New York City
BURDICK, PROFESSOR FRANCIS M., Columbia University, New York City
BURNS, EDWARD, 128 Broadway, New York City
BUTLER, GLENTWORTH R., 229 Gates Avenue, Brooklyn, N. Y.
BYINGTON, DR. RODERICK, 139 Bay 17th Street, Brooklyn, N. Y.
CABOT, MRS. F. H., 37 East 75th Street, New York City
CACCINI, DR. ATTILIO, 76 West 12th Street, New York City
CAESAR, HENRY A., 19 West 76th Street, New York City
CAMAC, DR. C. N. B., 108 West 65th Street, New York City
CAMPBELL, DR. DONALD D., Kingston Avenue Hospital, Kingston Avenue and Fenimore Street, Brooklyn, N. Y.
CANFIELD, GEORGE F., 49 Wall Street, New York City
CARLEBACH, EMIL, 136 West 86th Street, New York City
CARLEBACH, WALTER M., 136 West 86th Street, New York City
CARMAN, DR. A. R., 27 West 127th Street, New York City
CARNEGIE, ANDREW, 2 East 91st Street, New York City
CARNRICK, GEORGE W., 29 Sullivan Street, New York City
CARRINGTON, DR. THOMAS S., 105 East 22d Street, New York City
CAULDWELL, DR. CHARLES M., 16 West 54th Street, New York City
CHAPIN, S. B., 930 Fifth Avenue, New York City
CHAPMAN, MRS. JOHN JAY, 325 West 82d Street, New York City
CHILDS, WILLIAM H., 17 Battery Place, New York City
CLARK, FREDERICK AMBROSE, 347 West 89th Street, New York City
CLARK, MRS. LOUIS C., 21 West 47th Street, New York City
CLYDE, WILLIAM P., 24 State Street, New York City
COFFIN, C. A., 30 Church Street, New York City
COHN, DR. SALO, 139 West 126th Street, New York City
COLEMAN, DR. WARREN, 58 West 55th Street, New York City
COLLINS, DR. CHARLES FARNHAM, 50 West 55th Street, New York City
CONKLIN, ROLAND R., 1 Wall Street, New York City
CONNER, DR. LEWIS A., 53 East 49th Street, New York City
CONYNGHAM, W. BOULTON, 92 William Street, New York City
COTTER, DR. JOHN J., 164 West 73rd Street, New York City
CRANDALL, DR. F. M., 113 West 95th Street, New York City
CUMMINGS, H. K., 82 Wall Street, New York City
CURTIS, DR. H. HOLBROOK, 118 Madison Avenue, New York City
CUTTING, R. BAYARD, 32 Nassau Street, New York City
DARLINGTON, DR. THOMAS, 48 West 59th Street, New York City
DAVIS, DAVID T., 55 Liberty Street, New York City
DAVISON, E. MORA, 23 Nassau Street, New York City
DEFOREST, HENRY W., 30 Broad Street, New York City

DEFOREST, JOHNSTON, 30 Broad Street, New York City
DEFOREST, ROBERT W., 30 Broad Street, New York City
DELANO, WARREN, JR., 1 Broadway, New York City
DEMUTH, WILLIAM, 507 Broadway, New York City
DENCH, DR. EDWARD B., 15 East 53d Street, New York City
DENNIS, DR. FREDERIC S., 62 East 55th Street, New York City
DEVINE, EDWARD T., Room 607, Kent Hall, 116th Street and Amsterdam Avenue, New York City
DICKSON, DR. ARCHIBALD, Riverside Hospital Sanatorium, North Brother Island, New York City
DODGE, CLEVELAND H., 99 John Street, New York City
DODGE, MISS GRACE H., 262 Madison Avenue, New York City
DOTY, DR. A. H., Staten Island, N. Y.
DOUGLAS, JAMES, 99 John Street, New York City
DOW, MRS. FREDERIC G., 13 Central Park W., New York City
DRAPER, DR. WILLIAM KINNICUTT, 121 East 36th Street, New York City
DUNCAN, MRS. JOHN P., The Plaza, New York City
DUNHAM, DR. EDWARD K., 35 East 68th Street, New York City
EISENBERG, DR. ISIDORE C., 1281 Madison Avenue, New York City
EMERSON, DR. HAVEN, 120 East 62d Street, New York City
ERDMANN, WILLIAM, 15 West 68th Street, New York City
EVANS, DR. S. M., 115 East 39th Street, New York City
EWING, DR. JAMES, 477 First Avenue, New York City
FINLEY, PRESIDENT JOHN H., Amsterdam Avenue and 139th Street, New York City
FISCHER, WILLIAM H., 190 Franklin Street, New York City
FISHBERG, MAURICE, 1337 Madison Avenue, New York City
FISHER, DR. EDWARD D., 19 West 52d Street, New York City
FISK, DR. EUGENE L., Medical Director, Postal Life-Insurance Company, 35 Nassau Street, New York City
FISK, HARVEY EDWARD, 26 Exchange Place, New York City
FLEXNER, DR. SIMON, Rockefeller Institute, 66th Street and Avenue A, New York City
FOLKS, HOMER, State Charities Aid Association, 105 East 22d Street, New York City
FORBES, MISS MARY, Sage Foundation, 105 East 22d Street, New York City
FOX, HUGH F., U. S. Brewers Association, 109 East 15th Street, New York City
FRANK, SAMUEL, 200 West 86th Street, New York City
FRANKEL, DR. LEE K., Metropolitan Building, New York City
FRANKENTHAL, J., 2 West 86th Street, New York City
FREEMAN, DR. ROWLAND G., 211 West 57th Street, New York City
FREUDENTHAL, DR. W., 1003 Madison Avenue, New York City
FREUND, EMIL, 159 East 61st Street, New York City
FRICK, HENRY C., 640 Fifth Avenue, New York City
FRIED, DR. GUSTAV A., 64 West 85th Street, New York City
FRISSELL, A. S., 530 Fifth Avenue, New York City
FRISSELL, DR. LEWIS F., 113 East 56th Street, New York City
GASTON, GEORGE H., 1 Madison Avenue, New York City.
GASTON, MRS. MARTHA E., care of Marie Antoinette Hotel Company, 66th Street and Broadway, New York City
GEER, MRS. WALTER, 246 West 72d Street, New York City
GIBNEY, DR. V. P., 16 Park Avenue, New York City
GIBSON, DR. CHARLES L., 72 East 54th Street, New York City
GLEITSMAN, DR. JOSEPH W., 616 Madison Avenue, New York City
GLENN, JOHN M., 136 East 19th Street, New York City
GODKIN, LAWRENCE, 36 West 10th Street, New York City
GOETCHIUS, DR. H. D., 447 Fort Washington Avenue, New York City
GOODREDGE, DR. FREDERIC G., 122 East 78th Street, New York City
GORDON, GEORGE E., 787 Fifth Avenue, New York City
GOTTHEIL, PAUL, 148 West 75th Street, New York City
GOTTSBERGER, FRANCIS, 156 Broadway, New York City

GOULD, MISS HELEN M., 579 Fifth Avenue, New York City
GRANA, DR. JOSEPH, 599 Morris Avenue, New York City
GRANA, MRS. JOSEPH, 599 Morris Avenue, New York City
GREENHUT, B. J., Sixth Avenue and 19th Street, New York City
GUALANO, DR. CESIDIO F., 110 Washington Place, New York City
GUGGENHEIM, WILLIAM, 500 Fifth Avenue, New York City
GUITERAS, DR. RAMON, 80 Madison Avenue, New York City
HALPERN, DR. J., 51 East 91st Street, New York City
HAMILTON, MRS. ERNEST, Corresponding Secretary, Knickerbocker Relief Club, 741 East 176th Street, New York City
HARDON, HENRY W., 60 Wall Street, New York City
HARKNESS, EDWARD S., 26 Broadway, New York City
HARRIMAN, MRS. BORDEN, 35 East 49th Street, New York City
HARRISON, MISS MARIE L., 109 East 71st Street, New York City
HARTWELL, DR. JOHN A., 27 East 63d Street, New York City
HASTINGS, DR. THOMAS WOOD, 172 East 71st Street, New York City
HAUPT, DR. LOUIS, 232 East 19th Street, New York City
HAUSWIRTH, DR. LOUIS, 236 West 113th Street, New York City
HAVEMEYER, F. C., 129 Front Street, New York City
HELBIG, DR. FREDERIC M., 362 West 46th Street, New York City
HENTZ, HENRY, 769 St. Mark's Avenue, Brooklyn, N. Y.
HERMANN, FERDINAND, 20 East 80th Street, New York City
HESS, DR. ALFRED F., 154 West 72d Street, New York City
HIBBS, DR. RUSSELL A., 130 East 36th Street, New York City
HINE, FRANCIS L., 2 Wall Street, New York City
HOLT, MISS CONSTANCE, 2 West 94th Street, New York City
HOLT, DR. L. EMMETT, 14 West 55th Street, New York City
HOPPIN, WILLIAM WARNER, 52 William Street, New York City
HOVING, DR. JOHANNES, 262 Lenox Avenue, New York City
HOWK, DR. HORACE JOHN, 1 Madison Avenue, New York City
HOYT, THEODORE R., 17 Battery Place, New York City
HUBER, DR. FRANCIS, 209 East 17th Street, New York City
HUDDLESTON, DR. JOHN H., 145 West 78th Street, New York City
HUDNUT, ALEX. M., 5 Nassau Street, New York City
HURD, R. M., 59 Liberty Street, New York City
HUTCHINSON, DR. WOODS, Hotel Marseille, 103d Street and Broadway, New York City
HUTTON, PROFESSOR FREDERICK REMSON, 257 West 86th Street, New York City
HUYLER, FRANK DEK., 64 Irving Place, New York City
JACKSON, DR. GEORGE T., 11 East 48th Street, New York City
JACKSON, DR. V. H., 240 Lenox Avenue, New York City
JACOBI, DR. A., 19 East 47th Street, New York City
JAMES, DR. WALTER B., 17 West 54th Street, New York City
JANEWAY, DR. T. C., 131 East 60th Street, New York City
JEFFREY, A. M. L., 216 East 39th Street, New York City
JENKINS, JAMES, JR., Secretary, Committee on the Prevention of Tuberculosis, Brooklyn Bureau of Charities, 69 Schermerhorn Street, Brooklyn, N. Y.
JENNINGS, MISS ANNIE B., 48 Park Avenue, New York City
JOHNSON, MISS ELEANOR HOPE, 37 Madison Avenue, New York City
JONES, DWIGHT A., 34 West 51st Street, New York City
JONESSOFF, DR. E., 353 West 37th Street, New York City
KAHN, DR. ULYSSES S., 59 West 54th Street, New York City
KANE, MRS. JOHN INNES, 1 West 49th Street, New York City
KATZENBACH, W. H., The Wyoming, 55th Street and Seventh Avenue, New York City
KELLY, DR. THOMAS, 357 West 57th Street, New York City
KENNADAY, PAUL, 780 Park Avenue, New York City
KEPPLER, RUDOLPH, 25 Broad Street, New York City
KESSEL, LEO, 146 Central Park West, New York City
KINDRED, DR. J. JOSEPH, River Crest Sanatorium, Astoria, L. I., New York City

KINGSBURY, JOHN A., 105 East 22d Street, New York City
KINNICUTT, DR. FRANCIS P., 39 East 35th Street, New York City
KISSEL, MRS. CAROLINE I., 15 West 16th Street, New York City
KLEIN, DR. WILLIAM T., 456 East 138th Street, New York City
KLOTZ, DR. HERMANN G., 616 Madison Avenue, New York City
KNICKERBACKER, MRS. H., 135 Central Park West, New York City
KNIGHT, DR. AUGUSTUS S., 1 Madison Avenue, New York City
KNOPF, DR. S. A., 16 West 95th Street, New York City
KOHNS, LEE, 127 West 79th Street, New York City
KOHNS, MRS. LEE, 127 West 79th Street, New York City
KONIGER, EDWARD H., The Equitable Life Assurance Society of the United States, 165 Broadway, New York City
KOPLIK, DR. HENRY, 30 East 62d Street, New York City
LAGAI, G., 404 West 27th Street, New York City
LAIDLAW, DR. GEORGE F., 58 West 53d Street, New York City
LAMBERT, DR. ALEXANDER, 36 East 31st Street, New York City
LAMBERT, FRANK, 58 Coney Island Avenue, Brooklyn, N. Y.
LAMBERT, DR. SAMUEL W., 130 East 35th Street, New York City
LANGMAN, DR. GUSTAV, 121 West 57th Street, New York City
LAWRENCE, JOHN BURLING, 126 East 30th Street, New York City
LEE, PROFESSOR FREDERIC S., 437 West 59th Street, New York City
LEFEVRE, DR. EGBERT, 40 West 72d Street, New York City
LÉSSER, DR. A. MONAE, 16 West 68th Street, New York City
LEVI, ALBERT A., 108 Exchange Court, New York City
LEVI, MRS. ALBERT A., 108 Exchange Court, New York City
LEVI, EMIL S., 514 Broadway, New York City
LEWIS, DR. DANIEL, 616 Madison Avenue, New York City
LEWIS, MISS MARY E., 20 Fifth Avenue, New York City
LEWIS, DR. ROBERT, JR., 48 West 40th Street, New York City
LEWISOHN, ADOLPH, 42 Broadway, New York City
LIBMAN, DR. EMANUEL, 180 East 64th Street, New York City
LILIENTHAL, DR. HOWARD, 48 East 74th Street, New York City
LITTLE, DR. FRANK, 114 Montague Street, Brooklyn, N. Y.
LOCKE, DR. CHARLES F. A., 610 West 179th Street, New York City
LOEB, JAMES, 52 William Street, New York City
LORD, MISS I. E., Librarian Pratt Institute, Brooklyn, N. Y.
LOW, HON. SETH, 30 East 64th Street, New York City
LUELLEN, LAWRENCE, 115 Broadway, New York City
LUSK, DR. GRAHAM, Cornell Medical College, New York City
LUSK, DR. WILLIAM C., 47 East 34th Street, New York City
LUTHER, DR. FREDERICK, 47 Strong Place, Brooklyn, N. Y.
LYMAN, FRANK, 82 Wall Street, New York City
MCALPIN, DR. D. H., 3 East 54th Street, New York City
MCBURNEY, DR. CHARLES, 520 Park Avenue, New York City
MCKECHNIE, MISS MARY W., Treasurer, The National League of Nursing Education, 430 West 118th Street, New York City
MACNEAL, DR. W. J., Post-Graduate Medical School, 20th Street and Second Avenue, New York City
MACY, V. EVERIT, 68 Broad Street, New York City
MANGES, DR. M., 72 East 79th Street, New York City
MANN, FRANK H., Secretary, Committee on the Prevention of Tuberculosis, Charity Organization Society, 105 East 22d Street, New York City
MANNHEIMER, DR. GEORGE, 139 West 126th Street, New York City
MARKS, MARCUS M., 4 East 94th Street, New York City
MARSHALL, LOUIS, 47 East 72d Street, New York City
MAY, DR. WILLIAM ROPES, 121 East 38th Street, New York City
MELTZER, DR. S. J., Rockefeller Institute, 66th Street and Avenue A, New York City
MENDELSON, DR. WALTER, 159 West 74th Street, New York City

MERSEREAU, DR. W. J., 294 West 92d Street, New York City
MEYER, DR. ALFRED, 785 Madison Avenue, New York City
MEYER, DR. WILLY, 700 Madison Avenue, New York City
MILLER, DR. GEORGE N., 811 Madison Avenue, New York City
MILLER, DR. JAMES ALEXANDER, 18 West 51st Street, New York City
MILLS, WILLIAM WIRT, 249 Manor Road, West New Brighton, Staten Island, New York City
MOCK, HUGO, 220 Broadway, New York City
MOFFAT, MRS. GEORGE B., 6 East 70th Street, New York City
MOFFAT, R. BURNHAM, 12 East 66th Street, New York City
MOIR, HENRY, 256 Broadway, New York City
MORGAN, J. P., 23 Wall Street, New York City
MORGAN, WILLIAM FELLOWES, Arch 11, Brooklyn Bridge, New York City
MUNN, DR. JOHN P., 18 West 58th Street, New York City
NEILSON, FRANZ, 80 Wall Street, New York City
NELBACH, GEORGE J., Assistant Secretary, Committee on the Prevention of Tuberculosis, State Charities Aid Association, 105 East 22d Street, New York City
NETHERSOLE, MISS OLGA, 25 West 42d Street, New York City
NEWBOLD, MISS C. A., 109 East 72d Street, New York City
NEWCOMB, DR. JAMES E., 118 West 69th Street, New York City
NEWCOMB, MRS. JAMES E., 118 West 69th Street, New York City
NILES, DR. WALTER L., 55 East 76th Street, New York City
NORRIE, DR. VAN HORN, 21 West 37th Street, New York City
NORRIS, DR. CHARLES, 2131 Broadway, New York City
NORTHRUP, DR. W. P., 57 East 79th Street, New York City
O'BRIEN, MORGAN J., 2 Rector Street, New York City
OETTINGER, P. J., PH.D., 621 Broadway, New York City
ORDWAY, E. W., 1093 Dean Street, Brooklyn, N. Y.
OSBORN, MRS. H. FAIRFIELD, 850 Madison Avenue, New York City
OUTERBRIDGE, MRS. ETHEL BOYD, 38 East 62d Street, New York City
PARK, DR. WILLIAM H., 315 West 76th Street, New York City
PARKER, FRANCIS EYRE, 160 West 59th Street, New York City
PARSONS, JOHN E., 130 East 36th Street, New York City
PATTERSON, DR. HENRY STUART, 149 East 62d Street, New York City
PAULDING, J. K., 130 East 24th Street, New York City
PEASE, DR. HERBERT D., 39 West 38th Street, New York City
PECK, DR. CHARLES H., 30 West 50th Street, New York City
PECK, MISS SARAH W., 18 Fiske Place, Brooklyn, N. Y.
PEET, DR. EDWARD WRIGHT, 144 West 93d Street, New York City
PHIPPS, HENRY, 1063 Fifth Avenue, New York City
PHIPPS, JOHN S., 787 Fifth Avenue, New York City
PORTER, DR. EUGENE H., 181 West 73d Street, New York City
POST, ABRAM S., 81 Fulton Street, New York City
POTTER, MISS BLANCHE, 180 W. 59th Street, New York City
POTTER, DR. NATHANIEL BOWDITCH, 591 Park Avenue, New York City
PRATT, FREDERICK B., Pratt Institute, Brooklyn, N. Y.
PRICE, THEODORE, 82 Beaver Street, New York City
PRUDDEN, DR. T. MITCHELL, College of Physicians and Surgeons, 435 West 59th Street, New York City
PULLEY, DR. W. J., 945 Madison Avenue, New York City
RAVEN, A. A., 51 Wall Street, New York City
RIDDER, HERMAN, 182 William Street, New York City
ROBBINS, MISS SUSANE FORREST, Medical Department Metropolitan Life Insurance Company, New York City
ROBERTSON, JULIUS, 37 Spruce Street, New York City
ROCKEFELLER, JOHN D., 26 Broadway, New York City
ROESNER, SOL, 111 Fifth Avenue, New York City
ROGERS, DR. OSCAR H., N. Y. Life Insurance Company, 346 Broadway, New York City

ROSENBAUM, HERMAN S., 207 West 24th Street, New York City
ROUTZAHN, E. G., 31 Union Square, New York City
RUBINSTEIN, DR. J. L., 1667 Washington Avenue, New York City
SACHS, DR. B., 135 Central Park West, New York City
SALOMON, DR. HARRY, 258 Riverside Drive, New York City
SAYRE, DR. REGINALD H., 9 East 45th Street, New York City
SCHIEFFELIN, WILLIAM JAY, 5 East 66th Street, New York City
SCHIEREN, CHARLES A., Schieren Building, 30 Ferry Street, New York City
SCHIFF, JACOB H., 52 William Street, New York City
SCHILT, MRS. L., 331 West 101st Street, New York City
SCHOONMAKER, S. L., 14 Wall Street, New York City
SCOPES, WILLIAM H., 39 East 28th Street, New York City
SEAGER, PROFESSOR HENRY R., Columbia University, New York City
SEAMAN, MAJOR LOUIS L., 247 Fifth Avenue, New York City
SELIGMAN, ISAAC N., 1 William Street, New York City
SELIGMAN, JEFFERSON, 1 William Street, New York City
SEYMOUR, DR. N. GILBERT, 120 East 17th Street, New York City
SHAFFER, DR. NEWTON M., 17 East 38th Street, New York City
SHIVELY, DR. HENRY L., 303 Amsterdam Avenue, New York City
SIMPSON, DR. WILLIAM PAYNE, 76 West 47th Street, New York City
SMITH, DR. A. ALEXANDER, 18 West 51st Street, New York City
SOOYSMITH, CHARLES, 71 Broadway, New York City
STEIN, FRED M., 42 West 74th Street, New York City
STELLA, DR. ANTONIO, 214 East 16th Street, New York City
STERN, BENJAMIN, 32 West 23d Street, New York City
STETSON, FRANCIS LYNDE, 4 East 74th Street, New York City
STEWART, WILLIAM R., 31 Nassau Street, New York City
STILLMAN, DR. RALPH G., 128 West 59th Street, New York City
STIMSON, DR. DANIEL M., 28 West 37th Street, New York City
STOREY, DR. THOMAS A., 611 West 137th Street, New York City
STRAUS, NATHAN, 27 West 72d Street, New York City
STRAUSS, ALBERT, 1 William Street, New York City
STRAUSS, FREDERICK, 1 William Street, New York City
STUDDIFORD, DR. WILLIAM E., 124 East 36th Street, New York City
STURGIS, F. K., 17 East 51st Street, New York City
SYMS, DR. PARKER, 540 Park Avenue, New York City
TALMADGE, HENRY P., 50 Pine Street, New York City
TASCHMAN, DR. MAX, 68 West 114th Street, New York City
THACHER, DR. JOHN S., 20 West 50th Street, New York City
THACHER, THOMAS, 62 Cedar Street, New York City
TIFFANY, LOUIS C., 401 Fifth Avenue, New York City
TOD, WILLIAM STEWART, 5 Nassau Street, New York City
TOWNE, HENRY R., 121 Madison Avenue, New York City
TOWNSEND, HOWARD, 32 Liberty Street, New York City
TOWNSEND, DR. WISNER E., 125 West 58th Street, New York City
TRESCA, DR. E., 175 Worth Street, New York City
TUCKERMAN, ALFRED, 342 West 57th Street, New York City
TUCKERMAN, PAUL, 59 Wall Street, New York City
TUTTLE, DR. GEORGE M., 38 West 52d Street, New York City
UNTERBERG, I., 90 Franklin Street, New York City
VANDENBURG, DR. WILLIAM H., 30 West 48th Street, New York City
VAN INGEN, DR. PHILIP, 125 East 71st Street, New York City
VAN KIRK, MISS A. D., Mt. Sinai Training School, 101st Street and Madison Avenue, New York City
VAN PELT, JOHN V., 381 Fourth Avenue, New York City
VAN WAGENEN, BLEEKER, 443 Fourth Avenue, New York City
VEILLER, LAWRENCE, 105 East 22d Street, New York City
WALKER, J. T. AINSLIE, 1336 Whitehall Building, New York City

WALKER, DR. JOHN B., 39 East 33d Street, New York City
WALLACE, DR. CHARLTON, 507 Madison Avenue, New York City
WALSH, SAMUEL A., 14 Wall Street, New York City
WARBURG, FELIX M., 52 William Street, New York City
WARD, JOHN SEELY, JR., 1 Broadway, New York City
WATERBURY, JOHN I., Manhattan Trust Company, 20 Wall Street, New York City
WATERHOUSE, DR. M. M., 316 West 45th Street, New York City
WATERS, DR. BERTRAM H., 40 East 41st Street, New York City
WATERS, MISS YSABELLA G., 265 Henry Street, New York City
WEBBER, CHARLES A., 66 Court Street, Brooklyn, N. Y.
WEEKS, DR. JOHN E., 46 East 57th Street, New York City
WEEKS, RUFUS W., 346 Broadway, New York City
WESTCOTT, MRS. ROBERT E., 787 Fifth Avenue, New York City
WESTMORELAND, DR. F. S., North Brother Island, New York City
WEYL, WALTER E., 175 Second Avenue, New York City
WHIDDEN, DR. RAE W., 59 West 54th Street, New York City
WHITE, ALFRED T., 40 Remsen Street, Brooklyn, N. Y.
WHITE, EDWARD D., 265 Stuyvesant Avenue, Brooklyn, N. Y.
WHITE, HORACE, 18 West 69th Street, New York City
WHITE, THOMAS R., JR., 100 Broadway, New York City
WHITMAN, ALFRED A., 15 William Street, New York City
WILLARD, DR. THOMAS H., Metropolitan Life Insurance Company, 1 Madison Avenue, New York City
WILLCOX, WILLIAM G., 3 South William Street, New York City
WILLIAMS, DR. LINSLY R., 882 Park Avenue, New York City
WIMPFHEIMER, CHARLES A., 131 Spring Street, New York City
WING, FRANK L., Ninth Avenue and West 13th Street, New York City
WINTERS, DR. JOSEPH E., 25 West 37th Street, New York City
WOLFF, LEWIS S., 12 East 70th Street, New York City
WOLFF, MRS. LEWIS S., 12 East 70th Street, New York City
WOOLLEY, DR. JAMES V. S., 75 East 79th Street, New York City
WORMSER, MRS. ISIDOR, 836 Fifth Avenue, New York City
WRIGHT, DR. JONATHAN, New York Post Graduate Medical School and Hospital, Second Avenue and 20th Street, New York City
WUNDERLICH, DR. F. W., 8 Sidney Place, Brooklyn, N. Y.
WYETH, DR. JOHN A., 244 Lexington Avenue, New York City
ZWISOHN, DR. L. W., 249 West 122d Street, New York City

ADAMS, SAMUEL HOPKINS, 32 Chedell Place, Auburn, N. Y.
ADLER, ISAAC, 1008 Granite Building, Rochester, N. Y.
ANDREWS, MISS KATE RIDER, 19 Prince Street, Rochester, N. Y.
ARMSTRONG, DR. S. T., Hillbourne Farms, Katonah, N. Y.
BAKER, DR. EUGENE, 108 West Seneca Street, Ithaca, N. Y.
BAKER, W. L., 455 Ellicott Street, Buffalo, N. Y.
BALDWIN, DR. EDWARD R., Saranac Lake, N. Y.
BARROWS, HOWARD A., 410 Oxford Street, Rochester, N. Y.
BAUSCH, EDWARD, 281 East Avenue, Rochester, N. Y.
BAUSCH, W., care of Bausch and Lomb Optical Company, Rochester, N. Y.
BELL, DR. A. MACDONALD, Tupper Lake Sanatorium, Tupper Lake, N. Y.
BIGGS, DR. CHAUNCEY P., Ithaca, N. Y.
BLANCHET, DR. SIDNEY F., Trudeau, N. Y.
BLANKEMEYER, DR. H. J., Gabriel's Sanatorium, Gabriel's, N. Y.
BOMBARD, G. A., Saranac Lake, N. Y.
BOND, DR. G. F. M., 960 South Broadway, Yonkers, N. Y.
BOWDITCH, EDWARD, Rathbone, Sard & Company, Albany, N. Y.
BRAY, DR. H. A., Ray Brook, N. Y.
BRAYTON, DR. HARRY J., Iola Sanatorium, R. F. D. No. 2, Rochester, N. Y.
BREWER, DR. ISAAC W., Taughannock Falls, N. Y.

Brown, Dr. Lawrason, Saranac Lake, N. Y.
Burnett, Samuel H., 410 University Avenue, Ithaca, N. Y.
Burrell, D. H., Little Falls, N. Y.
Burrell, Loomis, Little Falls, N. Y.
Byington, Mrs. W. W., The Knickerbocker, 175 Jay Street, Albany, N. Y.
Chalmers, Arthur A., Amsterdam, N. Y.
Chapman, Dr. J. Francis, The Terrace, Katonah, N. Y.
Child, Dr. Frank S., Jr., Port Jefferson, L. I.
Comfort, Dr. Clifford V. C., 149 Barrington Street, Rochester, N. Y.
Conway, John A., Rexville, N. Y.
Covert, Dr. J. Byington, Geneva, N. Y.
Deans, Miss Agnes G., Sec'y, American Nurses' Association, 174 West 5th Street, Oswego, N. Y.
DeLaney, Dr. J. Pope, Geneva, N. Y.
Dick, Mrs. J. Henry, Islip, Long Island, N. Y.
Dorn, Dr. Elliott I., Otisville Sanatorium, Otisville, N. Y.
Doust, Dr. H. Burton, 641 Park Avenue, Syracuse, N. Y.
Duryee, George V. W., Saranac Lake, N. Y.
Eckel, Dr. George J., Tuberculosis Dispensary, 165 Swan Street, Buffalo, N. Y.
Elsner, Dr. Henry L., Fayette Park, Syracuse, N. Y.
Emans, Dr. J. Seymour, Rainbow Lake, Franklin County, N. Y.
Fairchild, F. L., P. O. Box 562, Saranac Lake, N. Y.
Farris, Dr. H. A., 19 Front Street, Saranac Lake, N. Y.
Feustmann, Maurice M., 64 Main Street, Saranac Lake, N. Y.
Fisher, George A., 70 Maple Avenue, Troy, N. Y.
Fitch, Dr. Ralph R., 365 East Avenue, Rochester, N. Y.
Fitchard, W. H., 206 Albany Street, Utica, N. Y.
Fleming, Dr. Walter S., 141 Rich Avenue, Mt. Vernon, N. Y.
Frey, Carl K., Utica, N. Y.
Gage, Professor Simon Henry, Cornell University, Ithaca, N. Y.
Gage-Day, Dr. Mary, 207 Wall Street, Kingston, N. Y.
Garvin, Dr. A. H., N. Y. State Hospital, Ray Brook, N. Y.
Goler, Dr. G. W., Health Bureau, 173 Alexander Street, Rochester, N. Y.
Goodall, Dr. Henry S., Stony Wold Sanatorium, Lake Kushaqua, N. Y.
Goodrich, Miss Annie W., State of New York Education Department, Albany, N. Y.
Green, Mrs. W. Jerome, 1 Rutger Park, Utica, N. Y.
Hart, H. Gilbert, 366 Genesee Street, Utica, N. Y.
Hart, Dr. James A., Slosson Homestead, Geneva, N. Y.
Havemeyer, J. C., Yonkers, N. Y.
Hazard, Mrs. F. R., Syracuse, N. Y.
Heffron, Dr. John L., 1228 South Salina Street, Syracuse, N. Y.
Heise, Dr. Fred H., Adirondack Cottage Sanatorium, Trudeau, N. Y.
Henderson, Charles R., Jr., Saranac Lake, N. Y.
Huyck, Mrs. Emily, 387 State Street, Albany, N. Y.
Jacobson, Dr. Nathan, Syracuse, N. Y.
Keith, Dr. Horace G., 307 South Broadway, Yonkers, N. Y.
Kelly, Dr. William Henry, 233 Western Avenue, Albany, N. Y.
Kerin, William E., Troy, N. Y.
Kieran, Sister Mary P. H., Gabriel's, N. Y.
Kimball, Dr. Grace N., 337 Mill Street, Poughkeepsie, N. Y.
King, Dr. Herbert Maxon, Loomis Sanatorium, Loomis, Sullivan County, N. Y.
Kinghorn, Dr. Hugh M., 14 Church Street, Saranac Lake, N. Y.
Kirstein, Louis E., Stein-Block Company, Rochester, N. Y.
Krumwiede, Dr. Charles, Jr., 15 Hobart Street, Bronxville, N. Y.
Lauderdale, Dr. Walter E., Geneseo, N. Y.
Leary, Dr. Montgomery E., 397 West Avenue, Rochester, N. Y.
Lenz, Dr. George, 68 Bleecker Street, Gloversville, N. Y.
Linch, Charles, 123 North Allen Street, Albany, N. Y.

Lo Grasso, Dr. Horace, New York State Hospital for Incipient Tuberculosis, Ray Brook, N. Y.
Lowdenbach, Miss Elizabeth, Trudeau, N. Y.
MacFarlane, Dr. Andrew, 274 State Street, Albany, N. Y.
McGibbon, D. Lorne, 52 Franklin Avenue, Saranac Lake, N. Y.
McKenney, Dr. J. D., 30 Woodland Avenue, Saranac Lake, N. Y.
McSweeny, Dr. E. S., Tuberculosis Sanatorium, Otisville, N. Y.
Madill, Dr. Grant C., Ogdensburg, N. Y.
Marvin, J. B., Jr., Saranac Lake, N. Y.
Meade, Miss Frances S., Lake Waccabuc, N. Y.
Mercer, A. Clifford, 324 Montgomery Street, Syracuse, N. Y.
Miller, Dr. John G., Lancaster, N. Y.
Mills, Dr. Charles W., Loomis Sanatorium, Loomis, Sullivan County, N. Y.
Moore, Dr. Veranus A., Ithaca, N. Y.
Morgan, Mrs. John B., Sterlington, Rockland County, N. Y.
Moriarta, D. C., Saratoga Springs, N. Y.
Munro, J. G., 61 Erie County Bank Building, Buffalo, N. Y.
Nelson, Dr. Stuart W., Old Forge, N. Y.
Nichols, Dr. Joseph Longworth, Saranac Lake, N. Y.
Norton, Dr. C. W., Cazenovia, N. Y.
Olcott, Dudley, Albany, N. Y.
Patterson, Dr. Charles Ector, 204 Main Street, Liberty, N. Y.
Paull, Dr. Chester A., Liberty, N. Y.
Phyfe, Dr. W. H., Chatham, N. Y.
Prest, Dr. Charles S., 54 Third Street, Waterford, N. Y.
Price, Dr. J. Woods, Saranac Lake, N. Y.
Proctor, Thomas R., Utica, N. Y.
Pryor, Dr. John H., 26 Linwood Avenue, Buffalo, N. Y.
Putnam, Dr. Emma, Hudson River State Hospital, Poughkeepsie, N. Y.
Quinton, Dr. W. W., 232 Elmwood Avenue, Buffalo, N. Y.
Ransom, Dr. J. B., Dannemora, N. Y.
Rathbun, Dr. Walter Latham, Otisville Sanatorium, Otisville, N. Y.
Rayevsky, Dr. Charles, Liberty, N. Y.
Rhame, Dr. William, Wantagh, N. Y.
Rochester, Dr. Delancey, 469 Franklin Street, Buffalo, N. Y.
Roosevelt, Theodore, Oyster Bay, Long Island, N. Y.
Rosenberg, Dr. Leopold, Montefiore Home Sanatorium, Bedford Hills, N. Y.
Rumsey, Mrs. Charles Cary, Arden, N. Y.
Ryttenburg, Dr. Charles, Tupper Lake, N. Y.
Sadlier, Dr. J. E., 295 Mill Street, Poughkeepsie, N. Y.
Schmid, Dr. H. Ernest, White Plains, N. Y.
Scott, George A., Nat'l Protective League, Waverly, N. Y.
Seward, William R., 218 Alexander Street, Rochester, N. Y.
Shalet, Dr. Louis, Otisville, N. Y.
Shaw, Dr. Henry L. K., 361 State Street, Albany, N. Y.
Shillady, John R., Secretary, Buffalo Association for the Relief and Control of Tuberculosis, 627 White Building, Buffalo, N. Y.
Steager, Mrs. Paul M., 380 Oxford Street, Rochester, N. Y.
Stockton, Dr. Charles G., 436 Franklin Street, Buffalo, N. Y.
Stover, Dr. Charles, 31 Division Street, Amsterdam, N. Y.
Straight, Mrs. Willard, Westbury, L. I.
Taylor, J. Merton, Taylor Instrument Company, Arms Street, Rochester, N. Y.
Tiffany, Miss Julia deForest, Oyster Bay, Long Island, N. Y.
Trembley, Dr. Charles C., Saranac Lake, N. Y.
Trudeau, Dr. Edward L., Saranac Lake, N. Y.
Twichell, Dr. David C., Saranac Lake, N. Y.
Vander Veer, Dr. William A., 28 Eagle Street, Albany, N. Y.
Vogeler, Dr. William J., 403 Palisade Avenue, Yonkers, N. Y.

Von Isakovics, Alois, Synfleuer Scientific Laboratories, Monticello, N. Y.
von Tiling, Dr. Johannes H., 278 Mill Street, Poughkeepsie, N. Y.
Ward, Dr. R. H., 53 Fourth Street, Troy, N. Y.
Ward, Dr. Samuel B., 281 State Street, Albany, N. Y.
Watson, Miss Lucy Carlile, 270 Genesee Street, Utica, N. Y.
Wheeler, Miss Lilla C., Portville, N. Y.
White, Dr. William H., Otisville Sanatorium, Otisville, N. Y.
Young, E. R., Saranac Lake, N. Y.

NORTH CAROLINA

Archer, Dr. I. J., Cragmont & Royal League, Black Mountain, N. C.
Battle, Dr. S. Westray, Asheville, N. C.
Booker, Dr. Lewis, North Carolina Sanatorium, Aberdeen, N. C.
Brooks, Dr. James E., Montrose, N. C.
Cotton, Dr. Clyde E., The Pines, Black Mountain, N. C.
Dunn, Dr. W. L., Asheville, N. C.
Egerton, Dr. J. L., Hendersonville, N. C.
Frazer, Dr. Thompson, Medical Building, Asheville, N. C.
Gladmon, Dr. Edwin, Southern Pines, N. C.
Greene, Dr. Joseph B., 29 Haywood Street, Asheville, N. C
Guerard, Dr. Arthur T., Heidelberg Sanatorium, Flat Rock, N. C.
Harris, Dr. F. R., Henderson, Vance Co., N. C.
Hyatt, Dr. Fred C., Greensboro, N. C.
Lapham, Dr. Mary E., Highlands, N. C.
Lewis, Dr. Richard H., Raleigh, N. C.
Ludlow, J. L., Chairman Anti-Tuberculosis Committee, Winston, Salem, N. C.
Mann, Dr. T. A., Durham, N. C.
Minor, Dr. Charles L., Asheville, N. C.
Morse, Dr. Lucius B., Hendersonville, N. C.
Orr, Dr. Charles C., Winyah Sanatorium, Asheville, N. C.
Perkins, Mrs. F. M., Fairview Cottage, Asheville, N. C.
Rankin, Dr. W. S., State Board of Health, Raleigh, N. C.
Ringer, Dr. Paul H., Asheville, N. C.
Saliba, M. M., 302 West Park Avenue, Wilson, N. C.
Stevens, Dr. Martin L., Asheville, N. C.
Von Ruck, Dr. Silvio, Winyah Sanatorium, Asheville, N. C.

NORTH DAKOTA

Bodenstab, Dr. William H., Bismarck, N. D.
Grassick, Dr. J., Grand Forks, N. D.
Healy, Dr. H. H., Grand Forks, N. D.
LaRose, Dr. V. J., Bismarck, N. D.
Stickney, Dr. Victor H., Dickinson, N. D.
Van Es, Dr. L., Agricultural College, N. D.
Westgate, Dr. S. S., Mott, N. D.

OHIO

Ach, Samuel, Forest and Washington Avenues, Cincinnati, Ohio
Allen, Dr. Samuel E., 22 West 7th Street, Cincinnati, Ohio
Andrews, Dr. Oran, I. O. O. F. Temple, East Liverpool, Ohio
Arms, Myron I., 639 Wick Avenue, Youngstown, Ohio
Atkinson, B. G., Court House, Cleveland, Ohio
Babcock, Mrs. W. A., 8914 Euclid Avenue, Cleveland, Ohio
Baker, Mrs. Sara M., 1703 East 115th Street, Cleveland, Ohio
Baldwin, Miss M. Helen, 519 Wick Avenue, Youngstown, Ohio
Ball, J. G., 2300 East 87th Street, Cleveland, Ohio

BANTING, C. C., 2455 Robinwood Street, Toledo, Ohio
BISHOP, DR. R. H., JR., Secretary, The Anti-Tuberculosis League of Cleveland, 501 St. Clair Avenue, Cleveland, Ohio
BITTINGER, FRANK D., 746 Euclid Avenue, Cleveland, Ohio
BROOKS, DR. E. R., Warrensville Tuberculosis Sanatorium, Warrensville, Ohio
BROWN, DR. N. WORTH, Madison Court, Toledo, Ohio
CASE, DR. CLARENCE E., Corner Park and Center Streets, Ashtabula, Ohio
CLARK, DR. COLIN R., 415 Bryson Street, Youngstown, Ohio
COLSTON, EDWARD, 111 East Fourth Street, Cincinnati, Ohio
COSTOLO, DR. J. W., District Tuberculosis Hospital, Lima, Ohio
DANIELLS, DR. RALPH P., 228 Michigan Street, Toledo, Ohio
DICE, DR. W. G., 240 Michigan Street, Toledo, Ohio
DOUGLASS, DR. STEPHEN, Ohio State Sanatorium, Mt. Vernon, Ohio
DOW, MISS M. C., Seventh and Race Streets, Cincinnati, Ohio
DUNHAM, DR. KENNON, 2503 Auburn Avenue, Cincinnati, Ohio
FORCHHEIMER, DR. F., Ortiz Building, Cincinnati, Ohio
FORD, DR. C. E., 207 Osborn Building, Cleveland, Ohio
FRIEDRICH, DR. MARTIN, Cleveland, Ohio
GAMBLE, JAMES N., Union Trust Building, Cincinnati, Ohio
GARLICK, H. M., Youngstown, Ohio
GERSTENBERGER, DR. H. J., 2500 East 35th Street, Cleveland, Ohio
HAGERTY, MRS. JAMES E., 94 East 15th Avenue, Columbus, Ohio
HAMANN, DR. C. A., 404 Osborne Building, Cleveland, Ohio
HARTMANN, SAMUEL D., Tippecanoe City, Miami County, Ohio
HARVEY, P. W., 2199 East 40th Street, Cleveland, Ohio
HAYNES, MAJOR J. T., State Soldiers' Home, Ohio
HOLMES, DR. CHRISTIAN R., 8 East Eighth Street, Cincinnati, Ohio
HOOVER, DR. C. S., Alliance, Ohio
HOOVER, DR. THOMAS C., 249 East State Street, Columbus, Ohio
HOVER, DR. WILLIAM E., 503 West Spring Street, Lima, Ohio
IRELAND, MRS. R. L., Lake Shore Boulevard, Cleveland, Ohio
JEFFREY, J. A., 581 East Town Street, Columbus, Ohio
JONES, DR. CLEMENT L., Jamestown, Ohio
LAMB, DR. MORGAN B., Department of Agriculture, State House, Columbus, Ohio
LEVI, LOUIS S., 532 Prospect Place, Cincinnati, Ohio
LOWMAN, DR. JOHN H., 1807 Prospect Avenue, Cleveland, Ohio
LYLE, DR. B. F., 19 West Seventh Street, Cincinnati, Ohio
MCCLELLAN, DR. W. M., Ashland, Ohio
MCCOMMON, DR. W. A., East Palestine, Ohio
MARKEY, DR. EDWARD B., 1101 North Main Street, Dayton, Ohio
MATHER, SAMUEL, Western Reserve Building, Cleveland, Ohio
MERRIAM, DR. WALTER H., 202 The Osborn, Cleveland, Ohio
MORGAN, DR. C. L., Ohio State Sanatorium, Mt. Vernon, Ohio
NORRIS, HON. M. A., Youngstown, Ohio
PATERSON, ROBERT G., 22 East Gay Street, Columbus, Ohio
PENNELL, DR. WILLIAM W., 205 North Main Street, Mount Vernon, Ohio
PESKIND, DR. A., 2414 East 55th Street, Cleveland, Ohio
PLACAK, DR. JOSEPH, 799 East 95th Street, Cleveland, Ohio
PROBST, DR. C. O., 185 East State Street, Columbus, Ohio
RAVOLGI, DR. A., 5 Garfield Place, Cincinnati, Ohio
RHU, DR. HERMANN S., P. O. Box 302, Marion, Ohio
ROBERTS, MRS. EDWARD A., 13176 Euclid Avenue, Cleveland, Ohio
ROTHENBERG, DR. SAMUEL, 22 West Seventh Street, Cincinnati, Ohio
SACHETT, DR. W. A., Akron, Ohio
SOUDER, DR. C. G., Nicholas Building, Toledo, Ohio
STEARNS, WILLIAM S., Lockland, Ohio
STEWART, DR. ROBERT W., Ortiz Building, Cincinnati, Ohio
TENNEY, DR. C. F., corner Lawrence and Monroe Streets, Toledo, Ohio

WICK, HENRY, 416 Wick Avenue, Youngstown, Ohio
WITHROW, S. P., 209 West 12th Street, Cincinnati, Ohio

OKLAHOMA

BARNARD, MISS KATE, State House, Oklahoma City, Okla.
CAMP, DR. F. K., 112½ West Main Street, Oklahoma City, Okla.
CONRAD, DR. H. W., Drake Building, Guthrie, Okla.
HUSON, HOBART, State House, Oklahoma City, Okla.
MAHR, DR. J. C., State Board of Health, Oklahoma City, Okla.

OREGON

BUSH, MRS. A. N., 978 Chemeketa Street, Salem, Ore.
CHALCRAFT, EDWIN L., Chemawa, Ore.
CLEMENTS, DR. H. J., State Insane Asylum, Salem, Ore.
KINNEY, DR. ALFRED, 269 Commercial Street, Astoria, Ore.
LADD, WILLIAM M., 243 West Park Street, Portland, Ore.
MATSON, DR. RALPH C., 1021 Corbett Building, Portland, Ore.
MATSON, DR. RAY WILLIAM, Portland, Ore.
PIERCE, DR. E. A., 811 Selling Building, Portland, Ore.
RANDLE, DR. H. C., Nehalem, Ore.
STEARNS, DR. R. W., Health Officer, Medford, Ore.
RODGERS, GEORGE F., Salem, Ore.
VOORHIES, MRS. GORDON, 622 Kearney Street, Portland, Ore.
WERNER, CHARLES M., 619 Worcester Building, Portland, Ore.

PANAMA

GORGAS, COL. WILLIAM C., Ancon, Canal Zone, Panama

PENNSYLVANIA

Philadelphia (For remainder of State see below.)

ALLEN, DR. FRANCIS OLCOTT, JR., 2216 Walnut Street, Philadelphia, Pa.
ANDERS, DR. JAMES M., 1605 Walnut Street, Philadelphia, Pa.
ARNOLD, MRS. MIRIAM, 1523 Girard Avenue, Philadelphia, Pa.
BEARDSLEY, DR. E. J. G., 2030 Chestnut Street, Philadelphia, Pa.
BEIN, AUGUST, 1729 Wallace Street, Philadelphia, Pa.
BISLER, G. A., 249 North 6th Street, Philadelphia, Pa.
BONAVENTURE, MOTHER M., Mount St. Joseph's Convent, Chestnut Hill, Philadelphia, Pa.
BRINTON, DR. WARD, 1423 Spruce Street, Philadelphia, Pa.
BROMLEY, JOSEPH H., Fourth and Lehigh Avenues, Philadelphia, Pa.
BURNHAM, GEORGE, JR., 1218 Chestnut Street, Philadelphia, Pa.
BURNHAM, WILLIAM, 4301 Spruce Street, Philadelphia, Pa.
CAMPBELL, MILTON, President H. K. Mulford Company, 412 South 13th Street, Philadelphia, Pa.
CARNETT, J. B., 318 South 15th Street, Philadelphia, Pa.
CASTNER, SAMUEL, JR., 352 Bullitt Building, Philadelphia, Pa.
CLARK, CLARENCE M., 321 Chestnut Street, Philadelphia, Pa.
CLARK, E. W., Bullitt Building, Philadelphia, Pa.
CLARK, HERBERT L., 321 Chestnut Street, Philadelphia, Pa.
CLARKE, DR. GEORGE G., The Majestic, Philadelphia, Pa.
COPLIN, PROFESSOR W. M. L., Jefferson Medical College, Philadelphia, Pa.
CRAIG, DR. FRANK A., 732 Pine Street, Philadelphia, Pa.
CRAIG, JOHN F., 143 South Front Street, Philadelphia, Pa.
DUHRING, REV. HERMAN L., P. E. City Mission, 225 South Third Street, Philadelphia, Pa.
EARLY, DR. THOMAS B., 2230 Tioga Street, Philadelphia, Pa.
EHRET, MRS. ALVIN M., 305 West Horter Street, Germantown, Philadelphia, Pa.
ELLINGER, DR. T. J., 737 North 41st Street, Philadelphia, Pa.

Ely, Dr. Thomas C., 1728 Chestnut Street, Philadelphia, Pa.
Fetterman, Dr. Wilfred B., Jr., 7042 Germantown Avenue, Philadelphia, Pa.
Flick, Dr. Lawrence F., 738 Pine Street, Philadelphia, Pa.
Foltz, Dr. J. Clinton, Summit Street, Chestnut Hill, Philadelphia, Pa.
Francine, Dr. Albert Philip, 1932 Spruce Street, Philadelphia, Pa.
Freeman, Dr. Walter J., 1822 Spruce Street, Philadelphia, Pa.
Furbush, Dr. C. Lineoly, 1501 Spruce Street, Philadelphia, Pa.
Fussell, Dr. M. Howard, 421 Lyceum Avenue, Roxborough, Philadelphia, Pa.
Gerhard, Dr. George S., 58th Street and Overbrook Avenue, Philadelphia, Pa.
Gerstley, Louis, 226 South Front Street, Philadelphia, Pa.
Gibbon, Dr. John H., 1608 Spruce Street, Philadelphia, Pa.
Gildersleeve, Dr. Nathaniel, University of Pennsylvania, Philadelphia, Pa.
Grabfelder, S., 406 Mariner and Merchant Building, Philadelphia, Pa.
Guckenheimer, Joseph, 117 South Second Street, Philadelphia, Pa.
Guernsey, Dr. Joseph C., 1923 Chestnut Street, Philadelphia, Pa.
Gwinn, Mrs. John, 228 South 21st Street, Philadelphia, Pa.
Hackenburg, William B., 1211 Arch Street, Philadelphia, Pa.
Hamill, Dr. Samuel McClintock, 1822 Spruce Street, Philadelphia, Pa.
Hatfield, Dr. Charles J., 2008 Walnut Street, Philadelphia, Pa.
Henszey, William P., Baldwin Locomotive Works, Philadelphia, Pa.
Horn, Franklin S., 1225 Market Street, Philadelphia, Pa.
Hutt, Dr. W. H., 1908 Fairmount Avenue, Philadelphia, Pa.
Jackson, Miss Rebecca, 922 Spruce Street, Philadelphia, Pa.
Jenks, Mrs. William F., 920 Clinton Street, Philadelphia, Pa.
Justice, William W., Germantown, Philadelphia, Pa.
Kaas, Andrew, 3 South 13th Street, Philadelphia, Pa.
Katzenberg, Isaac, 428 North Third Street, Philadelphia, Pa.
Kaufman, Dr. Isadore, 1115 Spruce Street, Philadelphia, Pa.
King, Dr. W. H., care of Fidelity Mutual Life Insurance Company, 112 North Broad Street, Philadelphia, Pa.
Kohn, Simon I., 720 Market Street, Philadelphia, Pa.
Kyle, Dr. D. Braden, 1517 Walnut Street, Philadelphia, Pa.
Landis, Dr. H. R. M., 11 South 21st Street, Philadelphia, Pa.
Lea, Charles M., 706 Sansom Street, Philadelphia, Pa.
Lea, Henry C., 2000 Walnut Street, Philadelphia, Pa.
LeConte, Dr. Robert G., 1530 Locust Street, Philadelphia, Pa.
Lit, Jacob D., Eighth and Market Streets, Philadelphia, Pa.
Liveright, Mrs. S., 910 North Broad Street, Philadelphia, Pa.
Longcope, Dr. Warfield T., Pennsylvania Hospital, Philadelphia, Pa.
McIlhenny, John D., Lincoln Drive and Johnson Street, Germantown, Philadelphia, Pa.
Mackay-Smith, Rev. Alexander, 1129 Walnut Street, Philadelphia, Pa.
Madeira, Miss Edith, 320 Walnut Street, Philadelphia, Pa.
Maloney, Martin, Land Title Building, Philadelphia, Pa.
Marshall, Dr. C. J., 5031 Pine Street, Philadelphia, Pa.
Mitchell, J. K., 3d, 227 South 18th Street, Philadelphia, Pa.
Montgomery, Dr. Charles M., 905 Pine Street, Philadelphia, Pa.
Montgomery, Mrs. T. H., 1815 DeLancey Place, Philadelphia, Pa.
Murray, Joseph E., 1420 Chestnut Street, Philadelphia, Pa.
Musser, Dr. J. H., 1927 Chestnut Street, Philadelphia, Pa.
Nash, Rev. James, 1121 Jackson Street, Philadelphia, Pa.
Neff, Dr. Joseph S., 584 City Hall, Philadelphia, Pa.
Norris, Dr. George William, 1530 Locust Street, Philadelphia, Pa.
Pugh, Charles E., Broad Street Station, Philadelphia, Pa.
Rhoads, Dr. Samuel, 152 School Lane, Germantown, Philadelphia, Pa.
Rhoads, Mrs. Sarah, 152 School Lane, Germantown, Philadelphia, Pa.
Ridgeway, C. S., 335 Arch Street, Philadelphia, Pa.
Rittenhouse, Benjamin F., 4613 Leiper Street, Frankford, Philadelphia, Pa.
Robinson, Dr. William Duffield, 2012 Mt. Vernon Street, Philadelphia, Pa.

Rodman, Mrs. Louis, Southwest Corner 21st and Spruce Streets, Philadelphia, Pa.
Roeck, Sister Maria, Kensington Dispensary, Hancock Street and Susquehanna Avenue, Philadelphia, Pa.
Rowland, Mrs. W. O., Frankford, Philadelphia, Pa.
Scott, Mrs. Mary Howard, 1830 Rittenhouse Square, Philadelphia, Pa.
Small, Dr. J. Hamilton, 914 South 48th Street, Philadelphia, Pa.
Snellenburg, Samuel, 12th and Market Streets, Philadelphia, Pa.
Solis-Cohen, Dr. Myer, 4102 Girard Avenue, Philadelphia, Pa.
Spear, James, Jr., 1014 Market Street, Philadelphia, Pa.
Stengel, Dr. Alfred, 1811 Spruce Street, Philadelphia, Pa.
Stern, Edward, 140 North 6th Street, Philadelphia, Pa.
Stewart, Dr. F. E., H. K. Mulford Company, 426 South 13th Street, Philadelphia, Pa.
Thomson, Frank Graham, 932 Land Title Building, Philadelphia, Pa.
Tyson, Dr. James, 1506 Spruce Street, Philadelphia, Pa.
Tyson, Dr. T. Mellor, 1506 Spruce Street, Philadelphia, Pa.
Ullom, Dr. Josephus Tucker, 24 Carpenter Street, Germantown, Philadelphia, Pa.
Van Valkenburg, E. A., The North American, Philadelphia, Pa.
Walsh, Dr. Joseph, 732 Pine Street, Philadelphia, Pa.
Wanamaker, John, City Hall Square, Philadelphia, Pa.
Wanamaker, Rodman, The North American, Philadelphia, Pa.
Wetherill, Mrs. John Price, 2014 Walnut Street, Philadelphia, Pa.
Willcox, James M., 700 Walnut Street, Philadelphia, Pa.
Williams, Ellis D., 560 Drexel Building, Philadelphia, Pa.
Willson, Dr. Robert N., 1708 Locust Street, Philadelphia, Pa.
Wilson, Alexander M., Assistant Director of Public Health, City Hall, Philadelphia, Pa.
Wilson, Dr. H. Augustus, 1611 Spruce Street, Philadelphia, Pa.
Wilson, Dr. J. C., 1509 Walnut Street, Philadelphia, Pa.
Wolf, Benjamin, Empire Building, 13th and Walnut Streets, Philadelphia, Pa.
Wolf, Clarence, Empire Building, 13th and Walnut Streets, Philadelphia, Pa.

Andrews, Charles E., Jr., New Bethlehem, Pa.
Arbuthnot, Dr. Thomas S., Fifth and Putnam Streets, Pittsburgh, Pa.
Awl, J. Wesley, Jr., 234 West State Street, Harrisburg, Pa.
Baker, John J., White Haven, Pa.
Berger, William H., Fairview, Wyncote, Pa.
Berger, Mrs. William H., Fairview, Wyncote, Pa.
Billings, Dr. F. T., 4524 Fifth Avenue, Pittsburgh, Pa.
Bonham, Miss Eleanor M., 152 East Market Street, York, Pa.
Bonham, Miss Elizabeth S., 152 East Market Street, York, Pa.
Brundred, Mrs. B. F., 315 West First Street, Oil City, Pa.
Canevin, Rt. Rev. Regis, Epiphany Parish House, Franklin and Congress Streets, Pittsburgh, Pa.
Chalfont, Mrs. Sarah W., Kennett Square, Pa.
Covert, Charles E., 222 Market Street, Harrisburg, Pa.
Cyril, Mother Mary, Mount St. Mary's Seminary, Scranton, Pa.
Deacon, J. Byron, Associated Charities of Pittsburgh, 535 Fulton Building, Pittsburgh, Pa.
Dilworth, Mrs. M. B., 5579 Fifth Avenue, Pittsburgh, Pa.
Dilworth, Miss Pauline, 5579 Fifth Avenue, Pittsburgh, Pa.
Dimmick, J. Benjamin, Scranton, Pa.
Dixon, Dr. Samuel G., Department of Health, Harrisburg, Pa.
Donnell, Miss Lucy Walker, 704 North Highland Avenue, Pittsburgh, Pa.
Dreifus, Charles, Frick Building, Pittsburgh, Pa.
Drexel, Mother Katherine, Convent of the Blessed Sacrament, Maud P. O., Pa.
Duff, William M., Forest Avenue and Brighton Road, Ben Avon, Pa.,
Dull, Mrs. A. P. L., 211 North Front Street, Harrisburg, Pa.
DuPuy, Mrs. Herbert, 646 Morewood Avenue, Pittsburgh, Pa.
Dutton, Dr. Walton Forrest, 401 Fourth Avenue, Carnegie, Pa.

EATON, FRED C., Wilburnie Oil Works, Warren, Pa.
EDWARDS, DR. J. F., Bureau of Health, Pittsburgh, Pa.
ELLENBERGER, DR. J. W., 922 North Third Street, Harrisburg, Pa.
ELY, CARL B., 307 North Front Street, Harrisburg, Pa.
ELY, MISS HENRIETTA B., Bryn Mawr, Pa.
FALK, DR. HARRY S., Emporium, Pa.
FELIX, O. F., 445 Water Street, Pittsburgh, Pa.
FINDLEY, DR. JOSEPH D., 802 12th Street, Altoona, Pa.
FISHER, DR. HENRY M., Jenkintown, Pa.
FRANK, ISAAC W., 5601 Irwin Avenue, Pittsburgh, Pa.
FRY, WILLIAM B., Drifton, Pa.
GABLE, DR. I. C., 46 South Beaver Street, York, Pa.
GENSEMER, GEORGE W., Pine Grove, Pa.
GILLILAND, DR. S. H., Marietta, Pa.
GRANEY, JOHN T., Bradford, Pa.
GREEN, DR. EDGAR M., 222 Spring Garden Street, Easton, Pa.
HADLEY, MRS. ALICE P., Swarthmore, Pa.
HAINES, DR. EDWARD STEEL, President Avenue, Rutledge, Pa.
HALL, ROBERT C., 240 Fourth Avenue, Pittsburgh, Pa.
HALL, DR. W. T., 401 Lock Street, Tarentum, Pa.
HARTMAN, DR. G. WILLIS, 1207 North Third Street, Harrisburg, Pa.
HARTMAN, DR. PAUL A., 202 Locust Street, Harrisburg, Pa.
HEINZ, H. J., Pittsburgh, Pa.
HEMSLEY, FREDERICK, Radnor, Pa.
HIESTAND, GEORGE, Marietta, Pa.
HILLEARY, DR. JESSE G., Du Bois, Pa.
HITCHENS, DR. A. PARKER, Glenolden, Pa.
HOBAN, RT. REV. M. S., Scranton, Pa.
HOLDSHIP, C. F., 422 First Avenue, Pittsburgh, Pa.
HOSTETTER, D. HERBERT, 59 Water Street, Pittsburgh, Pa.
HOUSTON, JAMES W., 1235 Liberty Avenue, Pittsburgh, Pa.
JENKINSON, A. M., 5425 Castleman Street, Pittsburgh, Pa.
JENKINSON, J. M., 1155 Liberty Avenue, Pittsburgh, Pa.
JOHNSON, DR. F. C., 22 West Union Street, Wilkes-Barre, Pa.
JOHNSTON, A. R., New Bloomfield, Pa.
JONES, DR. FREMONT C., Ebensburg, Pa.
KEMMERER, M. S., Mauch Chunk, Pa.
KENNEDY, DR. L. T., Pottsville, Pa.
KEPNER, JOHN A., Box 3, Harrisburg, Pa.
KERR, MRS. WILLIAM M., Trainer, Pa.
KNEELAND, EDWARD, 2303 Farmers Bank Building, Pittsburgh, Pa.
KOENIG, DR. CARL E., Pennsylvania State Sanatorium, Mont Alto, Pa.
KUNKEL, DR. O. F., Bradford, Pa.
LAIDLEY, DR. J. C., Carmichaels, Pa.
LANDIS, HON. CHARLES I., Common Pleas Court, Lancaster, Pa.
LEWIS, DR. W. H., Donora, Pa.
LITCHFIELD, DR. LAWRENCE, 5431 Fifth Avenue, Pittsburgh, Pa.
LOGAN, DR. S. G., Tyler, Clearfield Co., Pa.
LUDEN, W. H., 709 North Fifth Street, Reading, Pa.
MCCARTHY, DR. F. P., Pennsylvania State Sanatorium, Mont Alto, Pa.
MCCONWAY, WILLIAM, McConway, Torley Company, Pittsburgh, Pa.
MCDONALD, MISS MARGARET, Fern Cliff Sanatorium, White Haven, Pa.
MACFARLANE, JUDGE JAMES R., Woodland Road, Pittsburgh, Pa.
MARTIN, ROBERT L., 712 Lewis Block, Pittsburgh, Pa.
MELLON, R. B., 514 Smithfield Street, Pittsburgh, Pa.
MILLER, DR. J. S., York, Pa.
MILLER, DR. ROBERT T., JR., Bellefield Dwellings, Pittsburgh, Pa.
MINER, DR. CHARLES H., 115 South Franklin Street, Wilkes-Barre, Pa.

Montgomery, A. C., 1155 Liberty Street, Pittsburgh, Pa.
Morrell, Mrs. E. De V., Torresdale, Pa.
Pardee, Mrs. Calvin, White Marsh, Pa.
Park, James H. 2013 Oliver Building, Pittsburgh, Pa.
Putts, Dr. B. Swayne, 732 West 8th Street, Erie, Pa.
Ramage, Samuel Y., Oil City, Pa.
Reichel, Dr. John, Glenolden, Pa.
Ricketts, Col. R. B., 80 South River Street, Wilkes-Barre, Pa.
Rigg, J. E., Wilkinsburg, Pa.
Rothrock, Dr. A. M., 206 North 4th Street, Reading, Pa.
Satler, Charles E., 2318 Farmers Bank Building, Pittsburgh, Pa.
Schwartz, F. N., Box 594, Pittsburgh, Pa.
Sharpless, Dr. William T., 100 South Church Street, West Chester, Pa.
Sheafer, William L., Pottsville, Pa.
Shoemaker, Dr. Albert Moore, White Haven Sanatorium, White Haven, Pa.
Simmons, Dr. Richard H., 116 South Sixth Street, Shamokin, Pa.
Small, G. G., Aspinwall, Pa.
Snively, Dr. A. Barr, Blue Ridge Summit, Pa.
Speer, J. Ramsey, German National Bank Building, Pittsburgh, Pa.
Stites, Dr. Thomas H. A., State Department of Health, Harrisburg, Pa.
Stockdale, Elwell, White Haven Sanatorium, White Haven, Pa.
Stolzenbach, Dr. Frank D., 5517 Fifth Avenue, Pittsburgh, Pa.
Strauss, S. J., 21 South Franklin Street, Wilkes-Barre, Pa.
Taylor, M. H., 150 West Sixth Street, Erie, Pa.
Thaw, Benjamin, Morewood Place, Pittsburgh, Pa.
Torrance, Francis J., Standard Sanitary Manufacturing Company, Pittsburgh, Pa.
Van Norman, Dr. Karl H., Bedford Avenue and Wandless Street, Pittsburgh, Pa.
Voegtly, Robert, 916 Ohio Street, Allegheny, Pa.
Wadhams, Raymond L., 72 North Franklin Street, Wilkes-Barre, Pa.
Wainwright, Dr. J. M., 436 Wyoming Avenue, Scranton, Pa.
Walsh, Martin J., Parsons, Pa.
Walters, Dr. E. R., Department Public Health, Pittsburgh, Pa.
Wasley, Dr. Harry M., Shenandoah, Pa.
Wheeler, Mrs. Rachel A. S., Endeavor, Pa.
White, Dr. William Charles, Tuberculosis League of Pittsburgh, Bedford Avenue, Pittsburgh, Pa.
Wood, Mrs. Alan, Jr., Conshohocken, Pa.
Woods, Dr. Edward A., Equitable Life Insurance Company, Pittsburgh, Pa.
Wright, Dr. John W., 129 West Eighth Street, Erie, Pa.
Youngman, Dr. C. W., 601 Pine Street, Williamsport, Pa.
Zulich, Mrs. S. S., 814 DeKalb Street, Norristown, Pa.

PHILIPPINE ISLANDS

Heiser, Dr. Victor G., Director of Health, Bureau of Health of the Philippine Islands, Manila, P. I.

PORTO RICO

Brioso, Dr. Jose Gomez, P. O. Box 42, San Juan, P. R.
Igaravidez, Dr. P. Gutierrez, P. O. Box 1067, San Juan, P. R.

RHODE ISLAND

Barker, Dr. C. F., 32 Bull Street, Newport, R. I.
Barnes, Dr. Harry Lee, Rhode Island State Sanatorium, Wallum Lake, R. I.
Bushnell, Mrs. George, Peace Dale, R. I.
Chapin, Charles V., City Hall, Providence, R. I.
Cooke, Dr. Henry A., 234 Benefit Street, Providence, R. I.
Darrah, Dr. Rufus E., 10 Bull Street, Newport, R. I.
Fulton, Dr. Frank T., 36 Prospect Street, Providence, R. I.

GASSETT, DR. CHARLES B., State Sanatorium, Wallum Lake, R. I.
GREENE, SAMUEL WARD, East Greenwich, R. I.
HAMBLET, DR. MARY L., Rhode Island State Sanatorium, Wallum Lake, R. I.
HATCH, WALLACE, 55 Eddy Street, Providence, R. I.
HAZARD, MRS. AUGUSTA G., Peace Dale, R. I.
HAZARD, MISS CAROLINE, Peace Dale, R. I.
HAZARD, ROWLAND G., Peace Dale, R. I.
HOCHHAUSER, EDWARD, Executive Secretary, Society for the Relief and Control of Tuberculosis, 209 Oak Hall Building, Pawtucket, R. I.
HOWLAND, MISS ALICE M., Hope, R. I.
HOWLAND, DANIEL, Hope, R. I.
HOYE, DR. HENRY J., 194 Broad Street, Providence, R. I.
METCALF, JESSE H., Providence, R. I.
METCALF, MRS. JESSE H., Woodward Road, Providence, R. I.
PEABODY, DR. GEORGE L., Newport, R. I.
PERKINS, DR. JAY, 106 Waterman Street, Providence, R. I.
PUTNAM, DR. HELEN C., Rhode Island Avenue, Providence, R. I.
STOKES, JAMES BRETT, Room 6, Aquidneck Bank Building, Newport, R. I.
STONE, DR. ELLEN A., 280 Waterman Street, Providence, R. I.
SWARTS, DR. GARDNER T., State House, Providence, R. I.
WILLIAMS, DR. PEARL, 129 Broad Street, Providence, R. I.

SCOTLAND

BOYD, THOMAS HUNTER, Christian Institute, 70 Bothwell Street, Glasgow, Scotland

SOUTH AFRICA

HONEIJ, DR. JAMES A., 313 Schoeman Street, Pretoria, Transvaal, South Africa

SOUTH CAROLINA

BURDELL, DR. W. J., Lugoff, S. C.
CORBETT, DR. JOHN W., Camden, S. C.
CROSS, DR. ERNEST S., Aiken, S. C.
DAWSON, DR. JOHN L., 82 Tradd Street, Charleston, S. C.
GADSDEN, P. H., 141 Meeting Street, Charleston, S. C.
GAMBRELL, C. C., Box 266, Abbeville, S. C.
NEUFFER, DR. GOTTLOB A., Abbeville, S. C.
SULLIVAN, DR. M. D., Pelzer, S. C.
WILLIAMS, DR. C. F., Columbia, S. C.
WILSON, DR. ROBERT, JR., 165 Rutledge Avenue, Charleston, S. C

SOUTH DAKOTA

JAMES, DR. H. J., South Dakota State Sanatorium, Custer, S. D.
MILLER, DR. E. C., Brookings, S. D.
PETERS, OKEY E., Cavite, S. D.
SPAFFORD, DR. FREDERICK A., Flandreau, S. D.

SWITZERLAND

KLEBS, DR. ARNOLD C., Montolivet, Ouchy, Switzerland
SCHWYZER, DR. FRITZ, Kastanienbaum bei Luzern, Switzerland

SYRIA

EDDY, DR. MARY P., Mt. Lebanon Sanatorium, Beirut, Syria

TENNESSEE

BERRY, L. L., 214 Sixth Avenue, South, Nashville, Tenn.
CROCKETT, MRS. S. S., 710 Belmont Avenue, Nashville, Tenn.

DRESSER, MRS. PRUDENCE S., 1505 McGavock Street, Nashville, Tenn.
HAGGARD, DR. W. D., 148 Eighth Avenue, N., Nashville, Tenn.
JACOB, DR. M., University of Tennessee, Agricultural Experiment Station, Knoxville, Tenn.
KRAUSS, DR. WILLIAM, Randolph Building, Memphis, Tenn.
LITTERER, DR. WILLIAM, Nashville, Tenn.
MCCALL, JOSEPH W., Huntingdon, Tenn.
PATTEN, ZEBOIM C., President, Volunteer State Life Insurance Company, Chattanooga, Tenn.
SCHEIBLER, JULIUS W., 271 Court Avenue, Memphis, Tenn.
SEAY, DR. JOHN L., Whitwell, Tenn.
SNOWDEN, MRS. R. BRINKLEY, 1397 Central Avenue, Memphis, Tenn.
STRAIN, JOHN D., Secretary, Anti-Tuberculosis League, Nashville, Tenn.

TEXAS

APPEL, LIEUT. COL. D. M., Fort Sam Houston, Tex.
BALDWIN, DAVID G., Albert Baldwin Sanatorium and Health Resort, El Paso, Tex.
BRACKENRIDGE, HON. GEORGE W., San Antonio, Tex.
COLQUITT, MRS. O. B., President, Texas Anti-Tuberculosis Association, Governor's Mansion, Austin, Tex.
CORNICK, DR. BOYD, San Angelo, Tex.
COUTANT, DR. CLARENCE W., Texas Sanatorium for Tuberculosis, Llano, Tex.
FARMER, DR. W. C., San Antonio Tent Colony, San Antonio, Tex.
FLY, DR. D. R., Eberstadt Building, Amarillo, Tex.
HENDRICKS, DR. C. M., Masonic Temple, El Paso, Tex.
HEWITT, DR. JOSEPH H., Baylor University School of Medicine, Dallas, Tex.
HOMAN, DR. R. B., Box 113, El Paso, Tex.
LANKFORD, DR. JOHN S., San Antonio, Tex.
NEWTON, ROBERT J., Executive Secretary, Texas Anti-Tuberculosis Association, State Capitol, Austin, Tex.
PASCHAL, DR. F., San Antonio, Tex.
POPPER, GEZA, Greenville, Tex.
SAUVIGNET, DR. E. H., Laredo, Tex.
STARNES, G. J., 324 West Commerce Street, San Antonio, Tex.
THOMAS, DR. G. T., Carson Building, Amarillo, Tex.
WASHER, NAT M., San Antonio, Tex.
WILLIAMS, DR. ROBERT F., 1005 East Rio Grande Street, El Paso, Tex.

UTAH

BEATTY, DR. T. B., Utah State Board of Health, 39 Mercantile Block, Salt Lake City, Utah
BYRNES, DR. R. L., University of Utah, Salt Lake City, Utah
GRANT, HEBER J., Home Fire Insurance Company of Utah, 22 South Main Street, Salt Lake City, Utah

VERMONT

CAVERLY, DR. CHARLES S., Rutland, Vt.
HOLTON, DR. HENRY D., Brattleboro, Vt.
KIBBE, DR. EUGENE J., Vermont Sanatorium, Pittsford, Vt.
KLOTZ, DR. WALTER C., Vermont Sanatorium, Pittsford, Vt.
PARTRIDGE, F. C., Proctor, Vt.
PROCTOR, MISS E. D., Proctor, Vt.
PROCTOR, REDFIELD, Vermont Marble Company, Proctor, Vt.
TUCKER, DR. HENRY, Brattleboro, Vt.

VIRGINIA

BOSHER, DR. ROBERT S., JR., 11 North First Street, Richmond, Va.
CONRAD, DR. CHARLES E., Williamsburg, Va.
DREWRY, DR. WILLIAM F., Petersburg, Va.

EDMONDS, JAMES P., Stonega, Va.
GRANDY, DR. CHARLES R., 101 Freemason Street, Norfolk, Va.
HEDGES, DR. H. S., Charlottesville, Va.
HINSDALE, DR. GUY, Hot Springs, Va.
JOHNSTON, DR. GEORGE BEN, Richmond, Va.
LEVY, DR. E. C., Richmond, Va.
LLOYD, DR. JOHN J., Catawba Sanatorium, Catawba, Va.
MARSHALL, DR. HENRY T., University P. O., Va.
MARTIN, DR. RAWLEY W., Lynchburg, Va.
MUNFORD, MRS. B. B., F. R. D. 4, Box 67, Richmond, Va.
OMOHUNDRO, H., Hampton, Va.
RICE, LUTHER B., Reedville, Va.
RUCKER, DR. M. P., Manchester, Va.
SPILMAN, MRS. ANNIE, Elway Hall, Warrenton, Va.
STRUDWICK, EDMUND, P. O. Box 818, Richmond, Va.
WERTENBAKER, DR. CHARLES P., U. S. P. H. & M.-H. Service, Norfolk, Va.
WILLIAMS, DR. ENNION G., 1110 Capitol Street, Richmond, Va.
WOOLWINE, DR. CHARLES R., Catawba Sanatorium, Catawba, Roanoke Co., Va.

WASHINGTON

BARRON, JAMES, 2428 East Grand Street, Everett, Wash.
BEALS, MISS BETHESDA I., 915 Cobb Building, Seattle, Wash.
BENTLEY, DR. FREDERICK, 7045 Alaska Building, Seattle, Wash.
COOK, DR. A. L., Supt. Pulmonary Hospital of the City of Seattle, Seattle, Wash.
DAWSON, DR. LEWIS R., 427 Bailey Building, Seattle, Wash.
DENNY, MISS M. L., 1220 Boren Avenue, Seattle, Wash.
DURYEE, DR. A. P., American National Bank Building, Everett, Wash.
EARLE, DR. BAYLIS, Port Townsend Quarantine Station, Port Townsend, Wash.
GEPHART, A. R., General Secretary, The Associated Charities of Spokane, 415 Lindelle Building, Spokane, Wash.
KELLEY, DR. EUGENE, 514 Northern Bank Building, Seattle, Wash.
LANE, DR. JOHN E., North Yakima, Wash.
MCCONNELL, W. M., Secretary, Western Union Life Insurance Co., Spokane, Wash.
MCKIBBEN, WILLIAM K., Executive Secretary, Anti-Tuberculosis League of King County, Fourth and University Streets, Seattle, Wash.
PASCHALL, DR. BENJAMIN S., 664 Empire Building, Seattle, Wash.
SUTTNER, DR. C. N., Walla Walla, Wash.
WICKERSHAM, MISS NAN, 817 South 11th Street, Tacoma, Wash.

WEST VIRGINIA

BEURY, MRS. JULIA, Beury, W. Va.
DYE, DR. W. T. W., Grantsville, W. Va.
ENSIGN, JOHN W., 1330 Third Avenue, Huntington, W. Va.
GORDON, DR. P. L., Room 65, Bradford Building, Charleston, W. Va.
JACKSON, MRS. MALCOLM, 30 Bradford Street, Charleston Kanawha, W. Va.
KIDD, DR. JOHN W., Burnsville, Braxton Co., W. Va.
MCCUNE, DR. M. VIRGINIA, Shenandoah Valley Sanitarium, Martinsburg, W. Va.
RATHBONE, MRS. MARY E., 704 Ann Street, Parkersburg, W. Va.
SANDS, DR. WILLIAM H., Fairmont, W. Va.
SMITH, HARRISON B., President, Southern States Mutual Life Insurance Company, Charleston, W. Va.
SPURR, THE VEN. B. M., Moundsville, W. Va.
TOMPKINS, DR. W. W., 122½ Capitol Street, Charleston, W. Va.

WISCONSIN

ALLIS, LOUIS, 133 Stewart Street, Milwaukee, Wis.
AMUNDSON, DR. A. C., Cambridge, Wis.

Bean, Irving M., 4 Prospect Avenue, Milwaukee, Wis.
Bort, Albert N., Director Modern Woodmen of America, Beloit, Wis.
Bossert, Gottlob, 719 Franklin Place, Milwaukee, Wis.
Connor, Craig P., Auburndale, Wis.
Coon, Dr. J. W., Wisconsin State Tuberculosis Sanatorium, Wales, Wis.
Dearholt, Dr. H. E., 314 Goldsmith Building, Milwaukee, Wis
Evans, Dr. Edward, 121 South 13th Street, LaCrosse, Wis.
Harlow, Dr. George A., Northwestern Mutual Life Insurance Company, Milwaukee, Wis.
Hay, Dr. Thomas H., Stevens Point, Wis.
Hays, Charles D., 351 East Water Street, Milwaukee, Wis.
Johnson, Dr. Fred, North Freedom, Wis.
Joys, Mrs. Andrew M., 419 Lake Drive, Milwaukee, Wis.
Mayer, George P., Mayer Boot and Shoe Company, Milwaukee, Wis.
Nash, James B., Port Edwards, Wis.
Pabst, Gustave, 917 Chestnut Street, Milwaukee, Wis.
Ravenel, Dr. Mazÿck P., University of Wisconsin, Madison, Wis.
Reed, Dr. Edward N., Secretary LaCrosse County Medical Society, McMillan Building, LaCrosse, Wis.
Rice, Miss Anna, Green Gables Sanatorium, Hartland, Wis.
Schneider, Dr. Joseph, 311 Knapp Street, Milwaukee, Wis.
Shatto, Miss Edith, City Hall, Milwaukee, Wis.
Sidenburg, Paul, 351 East Water Street, Milwaukee, Wis.
Simpson, W. H., 3119 Grant Avenue, Milwaukee, Wis.
Stern, Walter, 525 Astor Place, Milwaukee, Wis.
Tate, Miss Edythe L. M., 314 Goldsmith Building, Milwaukee, Wis.
Thanhauser, Frank, 450 Kenilworth Place, Milwaukee, Wis.
Trux, Melville E., 123 North Court Street, Sparta, Wis.
Upmeyer, William H., Mark Block, Milwaukee, Wis.
Voje, Dr. J. H., Waldheim Park, Oconomowoc, Wis.
Walbridge, Dr. F. E., River Pines, Stevens Point, Wis.
Warfield, Dr. Louis M., Milwaukee County Hospital, Wauwatosa Wis.
Waters, T. B., Foster-Lothman Mills, Oshkosh, Wis.

WYOMING

Holliday, William H., Laramie, Wyo.
Wyman, Dr. W. A., Cheyenne, Wyo.

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